FLIGHT INSPECTION STANDARD OPERATING PROCEDURES MANUAL

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FEDERAL AVIATION ADMINISTRATION
FLIGHT INSPECTION STANDARD
OPERATING PROCEDURES MANUAL

RECORD OF CHANGES

On receipt of revision, insert revised pages in the manual and remove superseded pages. Record the revision number, revision date, date of entry, and the initials of the employee entering the revision.

Chg. No.	Change Date	Date Entered	By	Comments
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FLIGHT INSPECTION STANDARD
OPERATING PROCEDURES MANUAL

FOREWORD

The Flight Inspection Standard Operating Procedures Manual (FISOPM) is applicable to all personnel conducting flight inspection operations. It provides instructions for accomplishing the flight inspection mission requirements. This manual also provides guidance in using the Automatic Flight Inspection System (AFIS), including manual mode and other basic techniques. It contains information and procedures intended for use by aircrew personnel whose duties involve the inspection and certification of navigational aids supporting the National Airspace System and other United States aviation interests. The information and procedures contained herein will provide continuity between various offices and aircrews performing flight inspections.

All references to manuals, orders, or technical issuances (TI's) pertain to the latest revision or change of those documents. All current memorandums must also be considered when applying the information in this TI.

/s/

Edward W. Lucke, Jr.
Manager, Flight Inspection
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GLOSSARY OF ABBREVIATIONS AND ACRONYMS

AD	Airworthiness Directive
AET	Airborne Electronics Technician
AF	Airway Facilities
AFFIC	Air Force Flight Insp. Center
AFIS	Automatic Flight Insp. System
AFL	Aircraft Flight Log
AFM	Airplane Flight Manual
AGL	Above Ground Level
AIM	Aeronautical Information Manual
AIP	Aeronautical Information Publication
AIRNAV	Airport/ NAVAIDS Database
ALB	Aircraft Log Book
APL	Airport Lights
ARL	Aircrew Resource Location
ARR	AFIS Reference Radial
ARSR	Air Route Surveillance Radar
ASIS	Aviation Standards Information System
ASR	Airport Surveillance Radar
ATC	Air Traffic Control
AZ	Azimuth
BC	Back Course
CAT	Category
CBP	Clearance Below Path
CCW	Counter Clockwise
CDU	Control Display Unit
CEU	Control Electronic Unit
CF	Correction Factor
CFMSS	Centralized Flight Monitoring Scheduling System
CFR	Code of Federal Regulations
CMN	Control Motion Noise
CRM	Cockpit Resource Management
CW	Clockwise
DF	Direction Finding
DFL	Daily Flight Log
DEU	DME Electronic Unit
DME	Distance Measuring Equipment
DOD	Department Of Defense
DVOR	Doppler very high frequency omni-directional range
EL	Elevation
FAF	Final Approach Fix
FAS	Final Approach Segment
FBO	Fixed Base Operator
FCG	Foreign Clearance Guide
FDC	Flight Data Center
FDP	Facility Data Page
FICO	Flight Inspection Central Operations
FIFO	Flight Inspection Field Office
FIH	Flight Information Handbook
FIS	Flight Inspection System
FLIP	DOD Flight Information Publication
FMS	Flight Management System
FSDO	Flight Standards District Office
FSO	Flight Safety Officer
FSPM	Senior Flight Safety Officer
GNSS	Global Navigation Satellite System
GPSNP	GPS Non-Precision
GS	Glide Slope
GLS	Glide Slope (Hawker Section)
GSI	Glide Slope Intercept Altitude
HDOP	Horizontal Dilution of Precision
HFOM	Horizontal Figure of Merit
IAIM	Intl. Aeronautical Info. Manual
IAP	Initial Approach Fix
ICAO	Intl. Civil Aviation Organization
IFIO	International Flight Inspection Office
IMC	Inst. Meteorological Conditions
INS	Inertial Navigation System
IOE	Initial Operating Experience
IRU	Inertial Reference Unit
ISU	Inertial Sensing Unit

LAT	Latitude
LCA	Lowest Coverage Altitude
LOC	Localizer
LON	Longitude
LPV	Lateral Precision w/ Vertical
LRCOM	Long Range Communications
MAP	Missed Approach Point
MDA	Minimum Descent Altitude
MLS	Microwave Landing System
MMLS	Military Mobile Microwave Landing System
MOA	Memorandum Of Agreement
NASE	NAVAID System Evaluator
NCU	Navigation Computer Unit
NDB	Non-Directional Beacon
NFDC	National Flight Data Center
OCI	Out of Coverage Indication
OM	Outer Marker
OT&E	Operational Testing & Eval.
PAPI	Precision Approach Path Indicator
PAR	Precision Approach Radar
PAT&E	Production Accept. Test & Eval.
PC	Proficiency Check
PDU	Plasma Display Unit
PFE	Path Following Error
PFN	Path Following Noise
PIC	Pilot In Command
RCOM	En Route Communications
RDP	Runway Datum Point
RFI	Radio Frequency Interference
RII	Required Inspection Item
RNAV	Area Navigation
RTT	Radio Telemetering Theodolite
SDF	Simplified Directional Facility
SECRA	Secondary Radar
SFP	Special Flight Permit
SIC	Second In Command
SISE	Signal In Space Evaluator
ST	Satellites Tracked
SV	Satellites in View
SYM	Symmetry
TACAN	Tactical Air Navigation
TERPS	Terminal Instrument Approach Procedures
TIS	Time in Service
TVPS	Television Positioning System
UCR	Unsatisfactory Cond. Report
UCT	Universal Coordinated Time
VASI	Visual Approach Slope Indicator
VMC	Visual Meteorological Conditions
VOR	Very high frequency omni-directional range
VOT	VOR Test Signal

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CHAPTER I. FLIGHT INSPECTION OPERATIONS

1. GENERAL

A. CREWMEMBER REQUIREMENTS

No person may serve as Pilot-In-Command (PIC) or Airborne Electronic Technician (AET) of a Flight Inspection aircraft engaged in flight inspection activities unless they meet the following requirements:

(1) Each person must have completed the prescribed Flight Inspection Training. They must hold a Certificate of Authority, FAA Form 8430.9.

(2) Meet recent flight experience requirements of TI 4040.50, Aviation System Standards Operations Manual.

(3) The appropriate Manager/ Chief Pilot shall determine a crewmember's recency of experience and ability to accomplish the assigned scheduled mission requirements.

B. PRE-MISSION PROCEDURES

Prior to departing on a flight inspection mission, the following shall be accomplished:

(1) **PIC Duties**:

(a) Ensure that all necessary pre-mission briefings, flight release, and coordination are accomplished.

1 Aircrew briefing

2 Flight release

3 Airway Facilities coordination

4 Air Traffic coordination

5 Safety Briefing

6 Comply with any additional requirements of TI 4040.50

(b) Ensure that all documentation necessary to accomplish special flight inspection is aboard the aircraft, e.g., special requests and procedures packages, etc.

(2) **SIC Duties**: Those duties as assigned by the PIC.

(3) **Airborne Electronic Technician (AET) Duties**:

(a) The AET will comply with the following items appropriate to the aircraft being operated.

BEFORE TAKEOFF

1. ESCAPE HATCHES ....CHECKED
2. F.I. EQUIP. CIRCUIT BREAKERS ....CHECKED
3. OXYGEN MASK ....CHECKED
4. AFIS SELF-TEST .... COMPLETE
5. MOVEABLE WORK SURFACES ....STOWED
6. CABIN AISLE .... CLEAR
7. SEAT BELT/ SHOULDER HARNESS ....SECURE
8. TRAINEE/ PASSENGER..BRIEFED

BEFORE LANDING

1. MOVEABLE WORK SURFACES ....STOWED
2. CABIN...SECURE
3. SEAT BELT/ SHOULDER HARNESS ....SECURE

(b) **Additional Duties (AET):**

1 Ensure the operational status of the aircraft Flight Inspection System (FIS) and associated equipment to support the scheduled mission, i.e., plotter/ recorder, oscilloscope, receivers, spectrum analyzer, television positioning system, RFI tracking equipment, etc.

2 Review the Aircraft Flight Log (AFL), VN Form 4100-8, for aircraft equipment discrepancy write-ups and recent maintenance actions that might impact the FIS capability.

3 Verify that current navigational aid facility data and AFIS software are available and loaded into the AFIS memory.

4 Ensure that necessary auxiliary equipment and supplies are operational and stowed aboard the aircraft to support the scheduled mission.

5 Ensure that all documentation required to support the scheduled mission is aboard the aircraft.

6 Ensure the calibration book is aboard the aircraft and is current.

7 Assist the PIC as directed.

C. MISSION PROCEDURES

The following procedures shall be accomplished during a flight inspection mission:

(1) **Flight Inspection Coordination**: When conducting flight inspection operations in controlled airspace, proper coordination is imperative for safe and efficient operations. Specific requirements for coordination with air traffic are contained in FAA Order 8240.41, Flight Inspection/ Air Traffic Coordination. Additional guidance is provided in FAA Orders 8200.1, United States Standard Flight Inspection Manual (USSFIM), and 8240.32, Request for Flight Inspection Services. All crewmembers shall comply with the requirements of these orders, utilizing the specified terminology/ phraseology for all flight inspection activities.

(2) **Pilot & Co-Pilot Crew Procedures**.

(a) The left-seat pilot will maneuver the aircraft, assist with communications/ coordination, and maintain air traffic vigilance.

(b) The right-seat pilot will assist in looking for other air traffic, communicate and coordinate maneuvers with Air Traffic Control (ATC), program the Area Navigation (RNAV) and Flight Management System (FMS), and file flight plans.

(c) To ensure the most accurate measurement of the navigational signal-in-space, it is imperative that the aircraft be maneuvered in a smooth and stable manner. When possible, operate the aircraft coupled to the flight director and autopilot system. When viable data cannot be obtained due to weather conditions, terminate the inspection of that facility until more favorable conditions prevail.

(3) **AET Procedures are as follow**:

(a) Program AFIS operations for all flight inspection measurements in coordination with the PIC/ SIC and document AFIS results.

(b) Analyze facility performance data. Results that require facility adjustment, or any out-of-tolerance results, should be coordinated with the PIC before reporting to facilities maintenance.

(c) Conduct flight inspection air/ ground communications with facility maintenance personnel as required to complete mission.

NOTE

Ensure the system is configured for ACAR's Messaging when not utilized for communication with ground personnel.

(d) Ensure all parameters requiring AFIS operation during the flight inspection mission are completed to fulfill the requirements listed in Order 8200.1 and appropriate directives.

(e) Flight inspection without a back-up flight inspection navigational receiver is permissible; however, FAA maintenance must defer the discrepancy before the aircraft is operated. Ensure all receivers required for the mission pass the self-test. Back-up receivers should be operational before a commissioning inspection is attempted.

(f) During Radio Frequency Interference (RFI) missions, the AET will operate the RFI tracking equipment, relaying bearing information to the pilots, allowing them to maneuver the aircraft toward the area generating the RFI.

D. POST MISSION PROCEDURES

(1) **<u>Post Mission Briefing and Coordination:</u>**

(a) The PIC shall ensure that all flight inspection results and facility performance parameters are provided to the responsible facility maintenance and/ or air traffic personnel. The PIC shall take Notices to Airmen (NOTAM) action as necessary. This is accomplished through the appropriate Flight Service Station (FSS) or military base operations by radio or telephone as soon as practical. The PIC shall also confirm that these NOTAM(s) are issued.

NOTE

Refer to (2)(d) of this section for facility restrictions affecting facility data sheets.

(b) The AET shall participate in, or conduct briefings with facility maintenance personnel regarding the technical aspects of facility performance when required.

(2) **<u>Records and Reports</u>**: After flight inspection of a navigational aid facility, record and report the results in accordance with Order 8200.1; Order 8240.36, Instructions for Flight Inspection Reporting; and guidance specific to AVN policy. The division of post mission responsibilities will be as follows:

(a) **<u>The PIC Shall</u>**:

<u>1</u> Determine the acceptability of procedure packages and decide if the navigational aid supported the instrument procedure. Coordinate with AVN-100 or the military for the issuance of a Flight Data Center Notice to Airmen (FDC NOTAM), as required.

<u>2</u> Ensure all Aircraft Log Book (ALB) entries reflect aircraft status, and Daily Flight Logs (DFLs) accurately reflect facility status and the flight inspection work completed.

3 Ensure all Facilities and Equipment (F&E) job numbers and/ or reimbursable Memorandum of Agreement (MOA) information is annotated on the DFL.

4 Submit a flight inspection report for those facilities that do not require recordings or input from the ET, i.e., radar, NDB facilities, etc.

5 Sign all the Flight Procedures Control Forms (PCs), the Expanded Service Volume Form 6050-4, and other appropriate documents and FAX them, along with the DFL, to Flight Inspection Central Operations (FICO).

(b) **The SIC Shall**:

Perform duties as directed by the PIC, to assist in the completion of the Flight Inspection Itinerary.

(c) **The AET Shall**:

1 Ensure all recordings and supporting documentation are complete and accurately reflect facility performance.

2 Complete a flight inspection report for the co-signature of the PIC in accordance with Order 8240.36 for those facilities that require recorded data.

3 Ensure all flight inspection recorded data are properly annotated and forwarded to AVN-210A in accordance with Order 8200.1, Section 108.

4 Perform other duties as directed by the PIC, to assist in the completion of the Flight Inspection Itinerary.

(d) **Facility Data Sheets**: When flight inspection data results require a change in the Airport/ NAVAID (ASIS) database or the National Flight Data Center (NFDC) database, i.e. change in facility status, restrictions, receiver checkpoints, etc., the following shall be accomplished:

1 Complete VN 200 Form 8240-20 (Figure 1). "CANCEL": this portion of the form may be completed in either of two ways. Each individual restriction may be listed, or the CMPT and DATE portion or the first line may be completed with "All" entered in the REMARKS column. In a situation where more space is required, use multiple pages of the form.

"PUBLISH": this portion of the form will be completed showing the actual restriction and/ or checkpoint data as it is to be entered on the ASIS Facility Data Sheet.

2 Upon completion, VN 200 Form 8240-20 is sent directly to AVN-200 as an attachment to electronic mail, FAXED to (405) 954-3164, or mailed. The preferred method is electronic mail. Send to mailbox: 9-AMC-AVN-AVN-210-DATA.

3 Complete or annotate the errors on the ASIS data sheet. The PIC will complete the error corrections on facilities not requiring flight inspection recorded data. The AET will complete the corrections on facilities requiring flight inspection recorded data.

4 The Flight Inspection Field Office (FIFO) Lead Electronics Technician, or designated representative, shall ensure the corrected data has been transmitted to the Technical Support Branch (AVN-210) as soon as possible after the actual inspection. Reports and recordings received by AVN-210 are reviewed for conformity to FAA Order 8240.36.

(e) **AVN HQ Support**: When assistance is required from AVN-210 Technical Support Branch or the Policy and Standards Branch (AVN-230) regarding facility status or operation, the facility data collected by a FIFO may need to be FAXED or mailed to AVN in Oklahoma City. The minimum information required is: AFIS Facility Data Page, ASIS data used during the inspection, plot control page, raw and/ or corrected traces. If this data is FAXED, registration marks are required to return the pages to proper order.

(f) **Quality Control (QC):** All reports generated in a field office shall be quality checked prior to forwarding to AVN-210A for archiving. The Office Manager will assign a point of contact to maintain a QC program and act as liaison with AVN-210A. After final QC (all corrections by Pilot and/ or AET have been completed), the report and recording shall be sent to AVN-210A IAW Order 8240.36.

Figure 1

NAVAID FACILITY RESTRICTION/CHECKPOINT TRANSMITTAL

TO: AVN-210 **ATTENTION:**

Please submit the following changes for incorporation into the appropriate flight publications.

AIRPORT/FACILITY NAME: **ID:** **TYPE:**

CANCEL: **FACILITY RESTRICTION** ("FROM" CW "TO")

CMPNT	DATE	FROM	TO	BYD	BELOW	REMARKS

CHECKPOINT:

TYPE	AIRPORT	RAD	DIST	ALT	DESCRIPTION

PUBLISH: **FACILITY RESTRICTION** ("FROM" CW "TO")

CMPNT	DATE	FROM	TO	BYD	BELOW	REMARKS

CHECKPOINT:

TYPE	AIRPORT	RAD	DIST	ALT	DESCRIPTION

REMARKS:

FIFO USE

DATE OF INSPECTION:

PILOT: TECH:

VN 200 FORM 8240-20 (5/01)

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1. GENERAL OPERATION PROCEDURES

A. AIRCRAFT DIFFERENCES

This chapter applies to all aircraft in the FAA flight inspection fleet. It provides basic guidance to cover flight inspection systems and procedures that are presently in use.

(1) There are two basic types of flight inspection systems, the Sierra and the Parker. The Parker system is currently being upgraded to the MILTOPE display system. Operating instructions for the Parker flight inspection system are contained in the Parker Automatic Flight Inspection System Manual (T.I. 4040.55, AFIS AET, or T.I. 4040.56, AFIS Pilot). Standard terminology is used to help establish a common work base. Some aircraft have been modified with the new MILTOPE computer, display, and program. The operation of the flight inspection function has minor changes; the new system enhancements will be covered below. The basic procedures for the Parker System are used throughout this manual.

(a) <u>LR-60, CL-601</u>: These systems have a Tone Decoder Interface Unit mounted in the equipment bay across the aisle from the AET workstation. The primary function is to provide an along-track mark every 0.1 and 1.0 nm from the Global Positioning Inertial Reference Unit (GPIRU) sent to the printer/ plotter. The tone decoder interface combines the co-pilot runway update/ event, AET event, and 1020 Hz theodolite tone (from #3 VHF), generating an audio tone over the intercom system and a mark on the printer/ plotter.

(b) <u>MILTOPE</u>: This system will be installed in all aircraft according to aircraft schedule. The track ball on the keyboard or a discreet track ball may be used with this system. A cursor can be moved around the display using a track ball; clicking the proper button allows the scratch pad to become active wherever the cursor is placed. MILTOPE-equipped aircraft have the capability to save new facility data or modified data not found in the AFIS database for later retrieval.

(c) RTT: RTT capability is available in the BAe-800 and CL-601 equipped with the MILTOPE panel. All Sierra-equipped Hawkers are RTT capable. RTT procedures for Sierra are described in Section II.8G of this manual. Procedures for MILTOPE RTT calibration can be found in Section 7 (Special Operations) of this manual.

(d) Radio Frequency Interference (RFI): This equipment is installed in some of the aircraft; system operations are explained in Section 7 (Special Operations) of this manual.

(e) Navigational Aids Signal Evaluator (NASE): This equipment is temporarily installed in aircraft when it is needed to support Airway Facilities. System operations are explained in Section 7 (Special Operations) of this manual.

(f) LR60 VOR: There is a difference in course sensitivity between the cockpit and AFIS VOR receivers in the Lear. Lear crews will rely on AFIS as the standard for VOR structure determination. Any rapid course deviations that appear on the cockpit VOR receiver should be compared with AFIS for magnitude and flyability determination.

(2) The Sierra flight inspection system is significantly different from the Parker and requires different pilot and AET procedures. The equivalent Operational Procedures for the BAe-800 are contained in Section 8 of this chapter. Additional detailed instructions are contained in TI 4040.25.

(3) The following tables are to assist the flight inspection crew in assuring proper equipment configuration. This information is loaded by maintenance, and it should not be necessary for the AET to modify.

(a) In normal operation, the antenna is defaulted to the required antenna for the flight inspection mode entered. Use Table A to verify that the proper antenna is selected for flight inspection mode. Antenna selection is controlled on the Plot Control Page.

TABLE A

MODE	B300				LEAR 60				CL 601				BAe 800			
	SYS A	SYS B	SYS C	ANT	SYS A	SYS B	SYS C	ANT	SYS A	SYS B	SYS C	ANT	SYS A	SYS B	SYS C	ANT
VOR																
RADIN	VL1	TAC	OFF	N/A	VL1	TAC	OFF	AFT$_2$	VL1	TAC	OFF	FWRD$_2$	VL2$_4$	TAC1	OFF	FWRD$_2$
RADOUT	VL1	TAC	OFF	N/A	VL1	TAC	OFF	AFT$_2$	VL1	TAC	OFF	AFT$_2$	VL2$_4$	TAC1	OFF	AFT$_2$
ORBIT	VL2	TAC	OFF	N/A	VL1	TAC	OFF	AFT$_2$	VL1	TAC	OFF	AFT$_2$	VL2$_4$	TAC1	OFF	AFT$_2$
TACAN																
RADIN	VL1	TAC	OFF	BA$_3$	VL1	TAC	OFF	BA$_1$	VL1	TAC	OFF	BF$_1$	VL2$_4$	TAC1	OFF	TF$_3$
RADOUT	VL1	TAC	OFF	BA$_3$	VL1	TAC	OFF	BA$_1$	VL1	TAC	OFF	BA$_1$	VL2$_4$	TAC1	OFF	BA$_3$
ORBIT	VL2	TAC	OFF	BA$_3$	VL1	TAC	OFF	TA$_1$	VL1	TAC	OFF	BA$_1$	VL2$_4$	TAC1	OFF	TA$_3$
DME	N/A	N/A	OFF	N/A	N/A	N/A	OFF	N/A	N/A	N/A	OFF	N/A	N/A	N/A	OFF	N/A
ILS																
ILS-1	VL1	VL2	OFF	N/A	VL1	VL2	OFF	AFT$_2$	VL1	VL2	OFF	AFT$_2$	VL1	VL2	OFF	AFT$_2$
ILS-2	VL1	GS1	OFF	N/A	VL1	GS1	OFF	AFT$_2$	VL1	GS1	OFF	AFT$_2$	VL1	GS1	OFF	AFT$_2$
ILS-3	VL1	GS1	OFF	N/A	VL1	GS1	OFF	FWRD$_2$	VL1	GS1	OFF	FWRD$_2$	VL1	GS1	OFF	FWRD$_2$

Notes:

1. TACAN antenna selection is a manual function from the cockpit.
2. Forward/AFT VOR/LOC antenna selection on the LEAR, Challenger, and BAe-800 Aircraft to be controlled via NCU O/G output discrete.
3. TACAN antenna selection is a manual function from the inspector's console.
4. VL1 and TAC1 cannot be simultaneously displayed on the RMI; VL2 and TAC1 can be displayed on the RMI.

(b) Aircraft dimensions information is displayed on the System Setup Page in AFIS. This information is loaded by maintenance, and it should not be necessary for the AET to modify.

TABLE B

A/C Dimension	L60	CL601	BAe800	B300
ACDLN47	019.2	014.3	027.5	012.0
ACDLN41	-031.6 note	014.3	027.5	-022.0
ACDLN24	-002.5	026.3	-010.0	004.5
ACDLN48	009.2	004.3	026.4	003.0
ACDHT07	002.8	006.5	003.6	004.0
ACDHT08	008.8	11.4	006.6	009.0
ACDHT48	005.5	008.0	001.5	005.0
ACDLN34	-017.3	023.5	012.2	018.3
ACDLT34	001.5	-001.5	001.3	-000.7

ACDLN47 Distance from IRU #1 to Glide Slope (GS) antenna (+ for GS antenna forward of IRU)

ACDLN41 Distance from IRU #1 to Localizer (LOC) antenna (- for IRU forward of LOC antenna) (See NOTE)

ACDLN24 Distance from Radio Altimeter antennas to IRU #1 (+ for IRU forward)

ACDLN48 Distance from IRU #1 to forward MLS antenna (+ for MLS forward of IRU)

ACDHT07 Height of Glide Slope antenna above the ground with the aircraft level and weight on wheels

ACDHT08 Height of forward MLS antenna above the ground with the aircraft level and weight on wheels

ACDHT48 Height of forward MLS antenna above the IRU #1 (+ for MLS antenna above IRU)

ACDLN34 Distance from Camera to IRU #1 parallel to fuselage in feet (+ for IRU forward of Camera)

ACDLT34 Distance from Camera across to fuselage IRU #1 in feet (+ for camera left of IRU facing forward)

Note: The Lear 60 ACDLN41 dimension will be changed to +19.7 to match the antenna selection logic after nose antenna modification.

(c) The VOR/ LOC Antenna Normalization Table is used to balance received signals of selected system. This information is loaded by maintenance, and it should not be necessary for the AET to modify.

TABLE C
VOR/ LOC Antenna Normalization

	B300	L60	CL601	BAe 800
Bearing	dB	dB	dB	dB
0	+5	+5	+4	-4
30	+8	+7	+4	+4
60	+3	+6	+4	+5
90	+4	+1	+4	0
120	+3	+1	+4	0
150	+4	0	+5	+5
180	0	0	+4	0
210	+1	+2	+4	+6
240	+3	0	+4	+2
270	+6	0	+4	0
300	+3	+4	+4	+4
330	+2	+6	+4	+5

(d) The Antenna Gain Factor Table is the same for all Parker Hannifin-equipped aircraft. Antenna Gain Factors are entered to compensate for signal loss within the aircraft. A plus value means there is attenuation in the airplane, and all signal strength values will be increased a corresponding amount to represent outside world values. Plots on the printer/ plotter are only updated at the next power-up or at the next mode change. Information is loaded automatically during a program load and does not normally require revision.

Table D
Antenna Gain Factors

VOR/ LOC	+00 dB
GS	+00 dB
TACAN	+06 dB
MLS-FWD	+00 dB
MLS-AFT	+00 dB

B. SOFTWARE AND EQUIPMENT SELF-TEST

(1) The AET shall ensure the current and correct RNAV and Flight Inspection System (FIS) software versions are installed in the aircraft (current software revision is found as PGM on SERVICE PAGE).

NOTE

Current software revisions are available in a Numbered Memorandum on the Aircrew Information File (AIF).

The AET shall also ensure that current VOR receiver-calibration card data, antenna gain factors, TVPS calibration data, antenna normalization, and aircraft dimensions are correct and resident in the AFIS prior to flight. The above calibration pages shall be printed and archived with the first recordings on the first day of itinerary.

(2) A complete self-test of the flight inspection equipment will be performed prior to each sortie. The results will be printed and filed with the recordings of the first inspection of the sortie. Subsequent inspection recordings will be annotated to indicate the recording that contains the self-test results for that sortie (e.g. “Self-Test- XYZ ILS”).

C. DATABASE MANAGEMENT

(1) The Parker AFIS database cannot be permanently changed by the operator; however, the facility data for the facility being inspected may be temporarily modified. The AET will compare the stored data with a current ASIS data sheet prior to starting the inspection. Glide slope, PAR, and VGSI latitude and longitude: a tolerance of ± .02 seconds is acceptable due to rounding. If other aircraft data does not match the ASIS data sheet, use the ASIS data sheet information and notify the Flight Inspection Technical Support Branch (AVN-210). An AFIS printout of the data used for the inspection will be filed with the recordings.

(2) A supplemental database is available through the Data Logger drive. Modified data or new facility data may be saved and retrieved from the disk when the Supplemental Database is activated on the Flight Inspection Facility Data Page.

D. DATA RECORDING

(1) The following Display pages will be printed and recorded with each facility type inspection. Any time a change is made to these pages, the changed page shall be printed.

(a) SERVICE PAGE. This will indicate which inspection mode is selected, the crew names and numbers, Aircraft N number, with which facility the Self-Test results are located, and the Data Logger status.

(b) FI FACILITY DATA. This page displays what data is used for NCU inputs and calculations.

(c) PLOT CONTROL PAGE/ PAGES. This page(s) shows which traces are used, their baselines, and sensitivity. Normally, the plotter traces are used in the default conditions.

(d) NAV/ TEST CONTROL PAGE / PAGES. This page(s) provides the control and monitoring functions. See TI 4040.55 and TI 4040.56 for a detailed description for each mode of operation. This page is automatically printed when AFIS sensors meet required parameters or when STOP command is executed using EXEC CMD function.

(e) DME FIX PAGE: This page displays the current NAV Mode selected from five (5) available modes. See TI 4040.55 and TI 4040.56 for a detailed description for each mode of operation.

(f) Print any other pages that may be beneficial in analyzing facility performance or aircraft conditions.

(2) Printer Plotter Annotation: Full utilization of the Annotate Plot feature is recommended; however, manual annotation may be necessary. There should be adequate information to duplicate the flight inspection report by someone who was not on the itinerary. This is not a complete list. Annotations should be IAW Order 8200.1.

(a) Annotate the recordings with the run number sequence, transmitter number, and configuration. Also include any information that will be helpful in analyzing the recorded data.

(b) Identify the purpose of all event marks.

(c) Annotate all manual analysis.

(3) Alert Page: This page provides information of system or inspection out-of-tolerance conditions during an inspection. This page may be printed to help in analyzing facility and system problems.

E. AIRCRAFT COMMUNICATION

(1) **Left-Seat Pilot**:

ATC	Primary
Interphone	Secondary
FI Air/ Ground	Secondary

(2) **Right-Seat Pilot**:

ATC	Primary
Interphone	Secondary
FI Air/ Ground	Secondary

(3) **FI AET**:

FI Air/ Ground	Primary
Interphone	Primary
ACARS	Secondary
ATC	Secondary

NOTE

Hazardously Misleading Information (HMI). All crewmembers should monitor situations, clearances, and communications that could allow an aircraft to inadvertently use a signal undergoing tests, which could put it in an out-of tolerance condition. Notify ATC immediately upon occurrence.

F. AIRSPEED CONTROL

These recommended airspeed ranges are based on turbojet/ turboprop operation and are subject to the airspeed limitations imposed by FAR 91.117. Ground speed must be considered during orbits to allow for data collection speed of AFIS computer and the rate of aircraft crossing VORTAC radials.

(1) VORTAC Monitor/Reference Radial 170-210 KIAS

(2) VORTAC Approach Configurations 140-160 KIAS

(3) VORTAC Coverage Orbit MAX 250 KIAS

(4) VORTAC Alignment Orbits MAX 250 KIAS

- (a) Radius 6 to 8 nm MAX Ground Speed 190 KTS
- (b) Radius 8 to 10 nm MAX Ground Speed 210 KTS
- (c) Radius Beyond 10 nm MAX Ground Speed 250 KTS

(5) ILS/ MLS-1 170-250 KIAS

(6) ILS/ MLS-2 170-200 KIAS

(7) ILS/ MLS-3 Minimum stabilized maneuvering airspeed (no less than 90 KTS Ground Speed), i.e.

- (a) BE-300F 140 KTS
- (b) BAe-125 Flaps 15° V_{REF} + 25 Knots
- (c) LR-60 160 KIAS
- (d) CL-601 Flaps 20° V_{REF} + 10 Knots

G. AIRCRAFT POSITIONING

Positioning of the aircraft is critical to the data collection process. Close attention must be given to minimize crew induced positioning errors.

(1) Initialization: Although the Navigation Computer Unit (NCU) can refine its positioning, the positioning reference of the Inertial Reference Unit (IRU) will never be better than the accuracy of the location of the aircraft relative to the coordinates used for initialization.

(2) Prior to flight, the IRU will be initialized to known coordinates, either stored or manually entered. The hybrid update mode shall be used during initialization. Using the CHANGE AIRPORT function, enter the four-letter airport code to find the airport coordinates corresponding to the first runway threshold found in the database. If they are not found, use LAT/LON function to manually enter the airport reference point coordinates or other known coordinates at the airport. The aircraft should be parked as close as practical to these coordinates during initialization. The difference between the aircraft position and entered coordinates will become apparent as soon as updating begins; a 1 nm error is typical, but the error may be greater at larger airports.

(3) NCU Continuous Updating: The NCU must have real-time updating during operations. This is achieved by several methods, automatic and manual. The primary NCU update is automatic through the HYBRID GPS mode. However, three pilot selectable DME modes are available.

(a) Hybrid Mode (HYBRID): This is the preferred mode for flight inspection and may be used for en route operations. It uses both Inertial Sensing System (ISS) and GPS information for updates.

Parameters	**Expected Value**
HDOP	1.0 – 4.0
VDOP	1.0 – 4.0
HFOM	Less than 22 meters
Satellites in View (PRN)	5 minimum
SNR	30 db/Hz minimum
DME (Supported Waypoint)	Minimum –80 dbm

(b) GPS Mode (GPS): GPS position and velocity are used without ISS inputs. DME is not used in this mode.

(c) FLIGHT INSPECTION Mode (FI-DME): AFIS automatically selects up to 6 DME stations located around the facility under test. DME station error needs to be closely monitored. A DME with a station error of 0.2 nm or greater should not be used for flight inspection. AFIS may not select the most suitable stations for positioning. When this occurs, Manual DME Mode (MN-DME) is appropriate. Optimum geometry between any two DME is 90°. Adequate positioning can usually be achieved if the system is using two or more acceptable DME with 60° to 120° bearing difference. Manual updating is used when there are inadequate DME stations for positioning.

(d) RNAV DME Mode (RN-DME): This mode may be used during en route flight. It may also be used for flight inspection during coverage and airway checks when station alignment was determined using FI-DME or MN-DME. FI-DME Mode is limited to using DME near the facility under test. Position accuracy is lost when using FI-DME over long distances. MN-DME is usable if the positioning DME are updated with stations off the nose of the flight inspection aircraft.

(e) DME Manual Select (MN-DME): This mode may be used to improve DME updating by manually inserting or removing positioning DME(s) with an error of 0.2 nm or greater. When this mode is used for flight inspection, the stations selected should be noted in Remarks of the ASIS Data Sheet for future use.

(4) Manual Update: When manual updates are used, the NCU and DME must be disabled. Manual updates can only be executed from the pilot CDU. For manual updating, the aircraft must be positioned precisely over the checkpoint at a low enough altitude (usually 500 ft AGL) to ensure accuracy.

(a) To update over the facility being inspected, select FIX, then FI FAC on the pilot CDU. Fly over the facility and press "EXECUTE". If the facility being selected is an ILS, update over the Localizer antenna.

(b) To update over a known checkpoint other than the facility, enter the coordinates through the FIX button, then LAT/ LON buttons. Press "EXECUTE" when over the checkpoint. Good coordinates for manual updating are runway ends or another NAVAID. At islands or other locations where visual checkpoints are nonexistent, coordinates can be computed on a localizer centerline if a DME source within 23° of the centerline is available.

(5) NCU Reliability Factors: Radio Altimeter Error (RA ERR) displayed on ILS-3 NAV/ TEST CTRL Page 1 of 4 is a bias number applied to the radio altimeter vertical fix values used for computations. The RA ERR is established during the RA Self-Test: Lear 60 or Challenger 601 may be 4 ft or less; BE-300 or BAe-800 Parker Hannifin AFIS equipped 5 ft or less. If Vertical Accelerometer Bias (VABias) is greater than 2000 μgs, flight inspection operations shall be terminated until cause can be found and corrected. VABias shall be monitored during flight inspection operations; any changes greater than 200 μgs during a sortie could indicate NCU problems. The AET should pay special attention to data collected.

(6) NCU Position Update: May be necessary when the IRU S/ D deviation is greater than 2 nm and flight inspection results are suspect. The NCU position can be updated in flight to a specific FIX or facility through the pilot’s CDU FIX pages. The procedure for this function is found in TI 4040.56, Section 4.8.

H. MAINTENANCE ACTIONS AND FLIGHT INSPECTION REQUIREMENTS

This section restates the flight inspection requirements for various maintenance actions for specific facilities. The information was assembled from the current Airway Facilities maintenance handbooks. These requirements will be updated as handbook changes occur.

(1) Instrument Landing Systems (ILS)

(a) Activities **Requiring** a Confirming Flight Inspection. The following activities specifically require a confirming flight inspection:

1 Changes to obstructions, buildings, power lines, etc., that may affect the radiated signal.

2 Construction, runway repairs, etc., that were performed in the general localizer or glide slope area, if there is any doubt about how they affect facility performance.

3 A change in the facility-assigned operating frequency.

4 Repositioning of any of the glide slope antennas in the radiating array.

(b) Activities **Requiring** a Confirming Flight Inspection or **Regional Authorization.** The Regional Airway Facilities (AF) Division may authorize, on a case-by-case basis, facility restoration without a confirming flight inspection. This should include a telephone call from regional engineering, followed by a confirming letter. The restoration must be supported by a formal letter of authorization from the region, which lists the before and after readings, until the log entries covering these activities are purged.

1 Replacement of any transmit RF components, such as RF lines and antenna components, RF bridges, electronic modulators, power amplifier, power dividers, and transmitters as complete units if they contain any of these critical components

2 Repair or replacement of any of the localizer antennas in the radiating array, provided reference null data (individual pair and composite) is available

3 Replacement, removal, repair, or reinstallation of any of the glide slope antennas in the radiating array, provided the system is adjusted to the previously established reference H probe readings, i.e., phase and amplitude.

(c) Activities that **Do Not Require** a Confirming Flight Inspection. All other maintenance activities that meet the maintenance requirements of Order 6750.49 do not require a confirming flight inspection.

(2) VOR, DVOR, VOR/ DME, and VORTAC

(a) Activities **Requiring** a Confirming Flight Inspection:

1 Major changes in local obstructions or buildings, which may affect the signal strength, coverage, or courses.

2 Replacement or installation of the TAC/ DME antenna or RF subassemblies (excluding transmission lines) of the antenna.

3 Modernization or corrective maintenance of a major nature to the counterpoise, such as extension of the counterpoise.

4 A change in facility operating frequency.

5 A change in output power level for the purpose of increasing or decreasing service volume.

6 The installation and operation of the TACAN antenna (with no change to the VOR antenna system).

7 Those activities stated in subparagraph (b) below, when standard ground references cannot be reestablished.

8 The replacement or modification of the test generator if the tolerances for ground check cannot be met.

(b) Activities that **Do Not Require** a Confirming Flight Inspection. The following may be accomplished by maintenance personnel without a confirming flight inspection:

1 The replacement of any or all solid-state components.

2 The replacement or repair of equipment components or units.

3 The complete tuning of the transmitter.

4 The measurement and adjustment of all modulation levels.

5 Phasing adjustments

6 The replacement of Doppler VOR distributor.

7 The installation or relocation of the DME mast, the TAC monitoring pole, or a Remote Communications Outlet (RCO) antenna pole (if accomplished in accordance with current instructions).

8 The replacement of the polarizer when reset to the previous setting, or readjustment of the polarizer when a portable ground polariscope is used to optimize the facility for minimum vertical polarization.

9 The installation or replacement of obstruction lights, or the painting of the antenna shelter.

10 The Replacement of the RTA-2 upper and lower bearings, the spin motor, and the radome.

11 Accomplishment of other maintenance procedures, such as refurbishment of VOR/ DVOR counterpoise, wood decking, and/or terenplate, provided conditions are restored to those that existed at the time of the last flight inspection (as reflected in facility records) and ground check is within $\pm 0.2^0$ of the reference ground check.

12 Accomplishment of other maintenance procedures, such as any or all of the following, provided conditions are restored to those that existed at the time of the last flight inspection (as reflected in facility records).

a The repair, alignment, or replacement of the goniometer.

b The repair, replacement, modification, or repositioning of any fixed field detector used for facility monitoring.

c The replacement or modification of any signal evaluation element in the monitors.

d The adjustment or replacement of the RF transmission lines (including feedlines, stubs, positioners, and bridges, either coaxial or hybrid).

e The adjustment or replacement of the VOR antennas or components (including pedestals, loops, baluns, and supporting braces).

f The replacement, repair, or modification of test equipment. (For the VOR/ DVOR, if unable to make before and after measurements, a confirming flight inspection will not be required if the tolerances for ground check are met.)

(3) VHF OMNIRANGE TEST FACILITIES (VOT)

(a) Activities **Requiring** a Confirming Flight Inspection:

1 Changes in output power or attenuator settings that would affect station coverage.

2 Replacement of the antenna.

3 Major change in local airport obstructions, buildings, etc., that may affect the minimum signal strength and coverage.

(b) Activities **Not Requiring** a Confirming Flight Inspection:

1 All maintenance activities, such as replacement or repair of modules, solid state components, and transmission lines in the transmitter, monitor, or remote status and control unit (RSCU).

2 Adjustments to the transmitter, monitor, or RSCU, as long as all parameters are returned to the reference value.

(4) MICROWAVE LANDING SYSTEM (MLS).

Activities **Requiring** a Confirming Flight Inspection:

(a) Major changes in local obstructions or buildings that may affect the signal strength, coverage, or courses.

(b) Facility operating frequency changed.

(c) Replacement or repositioning of an azimuth, elevation, or DME antenna.

(d) Changes in the nominal electronic boresight alignment.

(5) MOBILE MICROWAVE LANDING SYSTEM (MMLS)

Activities **Requiring** a Confirming Flight Inspection:

(a) Major changes in local obstructions or buildings that may affect the signal strength, coverage, or courses.

(b) Changing CEU or DEU require confirming flight inspection.

(c) Facility operating frequency changed.

(d) Replacement or repositioning of an azimuth, elevation, or DME antenna.

(e) Changes in the nominal electronic boresight alignment.

(f) Change in data words that affect azimuth or elevation alignment.

(6) NON-DIRECTIONAL BEACONS (NDB).

Activities **Requiring** a Confirming Flight Inspection**:**

(a) Major changes in local obstructions, buildings, etc., which may affect the signal strength and coverage.

(b) Replacing the antenna with a different type antenna. Modifications of the antenna or to the ground plane.

(c) Change in the antenna current to increase or decrease the service area.

(d) Frequency change.

(7) DIRECTION FINDER (DF).

(a) Activities **Requiring** a Confirming Flight Inspection: The entire DF antenna array has been replaced, or any dipole elements have been repaired or replaced. All parameters are within normal operating tolerances.

(b) Activities **Requiring** a Confirming Flight Inspection or **Regional Authorization**. Doppler DF antenna systems--when no more than three dipole elements of the array have been repaired or replaced, the requirement for a flight inspection may be waived by the region, provided the following conditions are met:

1 The ground check is within initial tolerances.

2 Satisfactory operation of the DF is confirmed through two or more aircraft targets-of-opportunity.

3 Air Traffic personnel have received a pilot report that a facility has an error exceeding 6°, and the report has been verified by a bearing check of another aircraft in the same vicinity.

4 The facility has been re-commissioned or certified following an extended interruption, modernization, or antenna relocation, or for any other reason determined by the region to justify flight inspection.

(8) PRIMARY AND SECONDARY RADAR FACILITIES.

(a) Activities **Requiring** a Confirming Flight Inspection:

1 Anytime secondary radar directional output power is reduced below the minimum output power level, or the omni to directional power ratio is increased above the level previously flight inspected.

2 When the responsible regional office engineer, delegated by the regional AF division, deems it necessary to verify the operational capabilities of the equipment, due to circumstances affecting system performance.

3 A flight inspection may be requested after installation of a new map, if displayed fixes are not coincident with those on the previously certified map. Fix/ map accuracy checks of FAA radar are not required after installation of a new map overlay, video map, or digital map, because of added

or relocated navigational aids or fixes, if the controller is satisfied through evaluation of user traffic, that the new map is accurate. Controller/maintenance personnel retain the option to request a special fix/map accuracy flight inspection.

NOTE:

Initial evaluation of the facility will be conducted using targets-of-opportunity and radar data acquisition subsystems (RDAS). Final evaluation requires flight inspection.

(9) PRECISION RUNWAY MONITOR (PRM).

(a) Activities Requiring a Confirming Flight Inspection:

1 After an antenna change, antenna pattern tilt change, or when it is suspected that there has been a change in the antenna pattern.

2 When the responsible regional office engineer, delegated by the regional AF division, deems it necessary to verify the operational capabilities of the equipment, due to circumstances affecting system performance.

3 Anytime the receiver Sensitivity Time Control (STC) curve is adjusted to provide a greater gain reduction than the value previously flight inspected.

4 Anytime directional output power is reduced below the minimum output power level, or the sum to difference power ratio is increased above the level previously flight inspected.

5 Targets-of-opportunity shall not be used in lieu of a flight inspection, but may be used as a tool to justify a flight inspection when a change in the antenna pattern is suspected.

(10) TABLE 1 REFERENCE LISTING

ORDER	TITLE
6000.15	General Maintenance Handbook for Airway Facilities
6300.13	Radar System Optimization and Flight Inspection Handbook
6310.9	Maintenance of Airport Surveillance Radar (ASR-7, -7E, -7F, -8)
6310.19	Maintenance of the Airport Surveillance Radar, ASR-9
6340.13	Maintenance of Air Route Surveillance Radar, ARSR-3
6340.21	Maintenance of Air Route Surveillance Radar (ARSR-1, -2)
6340.26	Maintenance of Air Route Surveillance Radar, ARSR-4
6360.1	Maintenance of Air Traffic Control Beacon Interrogator (ATCBI)
6360.14	Maintenance of ATCBI-5 & MODE-S Collocated with SSRBD
6360.19	Maintenance of Precision Runway Monitor (PRM)
6365.3	Maintenance of the Mode Select (MODE-S) Beacon System
6530.3	Maintenance of Direction Finder (DF) Equipment
6730.2	Maintenance of Distance Measuring Equipment (DME)
6740.2	Maintenance of Non-Direction Beacons (NDB)
6750.49	Maintenance of Instrument Landing Systems (ILS)
6790.4	Maintenance of VHF Omni-range Equipment
6810.1	Maintenance of VHF Omni-range Test (VOT) Facilities
6810.3	Maintenance of FA-10235 VHF Omni-range Test (VOT) Facilities
6820.7	Maintenance of NAVAIDS Facilities – VOR, DVOR, VOR/DME, VORTAC
6830.3	Maintenance of Microwave Landing Systems (MLS)
6850.5	Maintenance of Lighted Navigational Aids

CHAPTER II. AIRCRAFT OPERATIONS

2. ILS OPERATION PROCEDURES

A. GENERAL

The AET will program the AFIS for facility configuration, run direction, front/ back course, measurement parameters, and arc distances; the pilot will program flight plan functions. The minimum traces required for ILS checks are: Crosspointer, Flag/ Modulation, Signal Strength/ AGC, ID, FI-Mark, Ground Speed, Error Traces, and DME Range error. Print the Plot Control Page for each flight inspection mode used during inspection and anytime a calibration scale parameter is changed. AFIS run numbers may be used, or manually annotate run numbers on the recordings; each run number should match the run sequence on the ILS Worksheet. All PIC, SIC, and AET event marks shall be labeled. Print the NAV TEST CONTROL page(s) at the end of each run. Endfire glide slope transverse structure is measured using the ILS-1 Mode; refer to paragraph b(5) below.

(1) ILS Offset Unit: The primary purpose of the Offset Unit, when installed, is to intentionally offset glideslope and localizer readings on associated ILS instruments in the cockpit when up, down, right, or left ILS offset is selected by the pilot. Operation is covered in related sections (ILS-2 & 3).

(2) ILS Receiver Deviation Status: The deviation status traces for the Localizer, Glide Slope, and ILS/ DME are available in all ILS modes respectively. Although added for engineering analysis for receiver malfunctions, these traces (DEV STATUS) may be used to aid the AET in analyzing facility operation and troubleshooting during flight inspection. Trace deflection during times of unusable or invalid ILS signal may alert the AET of facility problems. Facility operational status shall not be assigned based on indications from these traces. Application of FAA Order 8200.1 will be the determining factor when assigning facility status. Loss of any required recorded trace may be considered an Out-of-Tolerance (OT) condition, and the run shall be reflown to verify proper facility operation.

B. ILS-1 MODE

This mode measures localizer clearances, modulation, course width, and symmetry. Annotate the altitudes and distances used.

(1) AFIS Setup: Set and confirm configuration, arc direction, and distance from localizer to be flown. If width only is going to be measured, changing calibration of raw crosspointer to 50 µA per inch allows greater precision for manual calculations.

(2) Maneuvering: Program the AFIS and autopilot to fly an arc for evaluating the localizer. Normal lateral limits are 35° left and right of centerline for measuring clearances. When measuring course width, only an arc from 10°-0-10° may be flown. Altitudes higher than LCA may be used within the provisions of Order 8200.1, Section 217.

ALERT

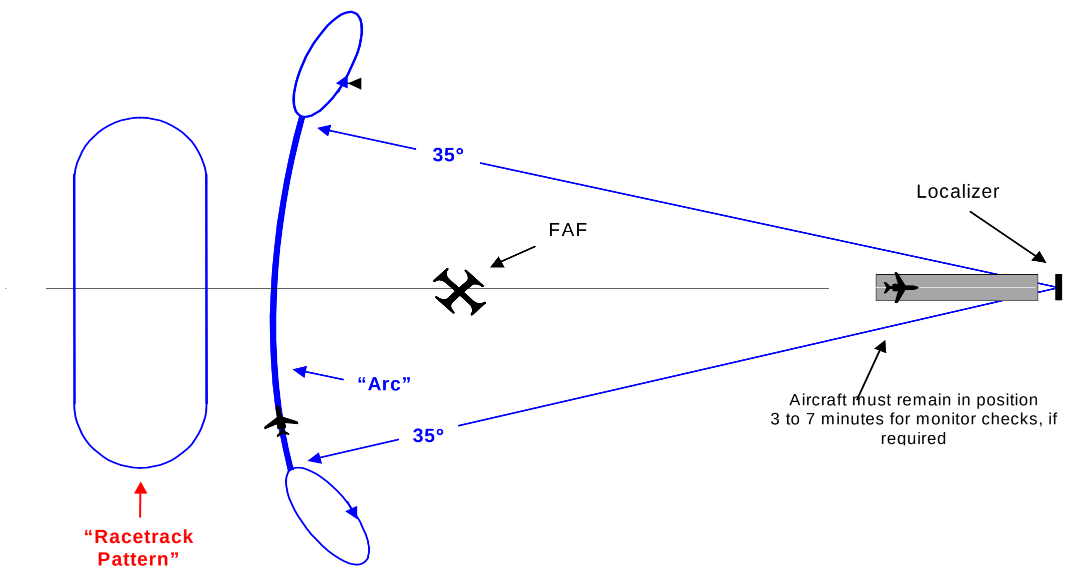
When low clearance points are announced in Sector 1, clearances must be verified by manual analysis of recordings.

NOTE

Minimum distance from localizer for reliable AFIS data is 3 nm.

"FLIGHT INSPECTION ARC"

ILS/MLS Front or Back Course



The racetrack pattern is used only during localizer width monitor checks. The racetrack pattern is flown 90° to the localizer centerline with 5-mile legs. Distance from the Localizer antenna is between 4 and 18 miles or extended service volume (ESV) as required.

CAUTION

OBSTACLE CLEARANCE AT LCA IS NOT GUARANTEED OUTSIDE OF THE PUBLISHED APPROACH PATH.

(3) Monitor Checks: During monitor checks, the final Normal width may be flown from 10°-0-10°. There is no requirement to measure clearance in final normal configuration if clearances were satisfactory in monitor configuration.

NOTE

CW/ CCW acceptable width difference is 2.5% of actual width measurement.

(4) Fix Updating: Updating is accomplished with no crew actions required. Refer to Section 1, Paragraph G(4) if manual fix updating is required.

(5) Transverse Structure: The Endfire glide slope transverse structure is measured 12° left and right of runway centerline. The Parker AFIS will correctly display these points in the ILS-2 profile. To obtain the correct azimuth offsets in ILS-1 or ILS-3 Mode, the Flight Inspection Data Page must be manipulated to show **LC-GS-DIS as "0".** This will display distance to centerline abeam glide slope on the NAV/ TEST Control Page.

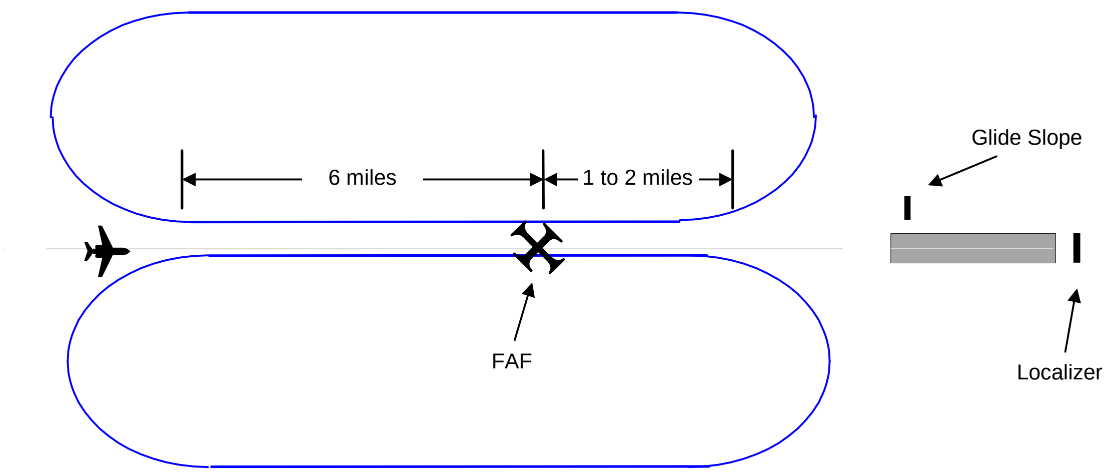
C. ILS-2 MODE

This mode measures Glide Slope angle, path width, symmetry, clearance above path (CAP), structure-below-path (SBP), and signal strength.

(1) **AFIS Setup**: Set and confirm transmitter configuration, ground temperature, airborne temperature, and altimeter setting for the local area. Check data sheet remarks for non-standard width measurement area. If necessary, the path width measurement points may be changed according to Order 8200.1, Section 217. When a point other than 75μA is used, the new point shall be documented on the ASIS datasheet and used in all subsequent inspections.

(2) Maneuvering: Program the AFIS and autopilot; fly and evaluate the glide slope during a level run inbound on-course or offset as necessary for the run. (The pilot may enter an OFFSET BRG on ILS-2 NAV/ TEST CTRL DATA Page. The CDI needle will be centered when flying the offset.) The GSI altitude, corrected for temperature and pressure, is flown under most instances; other altitudes may be used, IAW Order 8200.1, Section 217. Execute the run when aircraft is heading no more than 45° from front RWY BRG and with at least -200 μA fly up signal. Continue inbound to ensure at least **150 μA** of fly down is recorded.

"FLIGHT INSPECTION HOLDING PATTERN"
ILS/MLS Front course only



The flight inspection holding pattern is flown on centerline from 6 miles or 200 µA fly-up outside the Final Approach Fix (FAF) (approximately 10 miles from the runway) to approximately 2 miles inside the FAF. The altitude will normally be at GSI. Left or right turns are at the discretion of Air Traffic.

(3) Monitor Checks: Glide Slope (GS) width reference limit (monitor) checks are completed in this mode. A correction factor is applied to the calculated GS angle displayed when GS width is in a monitored configuration. **Angle Correction Factor**: Compare the normal GS angle found in ILS-2 Mode with the normal angle found on the ILS-3 Mode. The difference is the correction factor to be applied to the GS angle found in monitor configurations (ILS-2). If significant changes in altimetry data occur during the inspection, new correction factors may be required.

NOTE:

Correction factor has been applied when FIN is displayed in the Status Column.

(4) (Fix Updating): There are three methods of updating AFIS in ILS-2 Mode. Two are automatic fix updates. The preferred method for AFIS position updating is Hybrid Mode. This requires no updating response by the crew, regardless of the Final Approach Fix type. The second automatic method uses the Outer Marker to provide the update. The AFIS position updating must be in FI-DME, RN-DME, or MN-DME. The third method is manual; the facility or landmark is used for the pilot to update aircraft position. Refer to Section 1, paragraph G (4) if manual fix updating is required.

(5) Glide Slope Tilt Check: (Using ILS Offset Unit) Selection of the right or left arrow will cause the cockpit CDI to indicate "on-course" when the aircraft is either 150 µA in the 150 Hz or 90 Hz, respectively. Again, the AET's indications are of aircraft actual displacement, this time from Localizer centerline. The AET should verify the indicated arrow correctly corresponds to the received ILS crosspointer information.

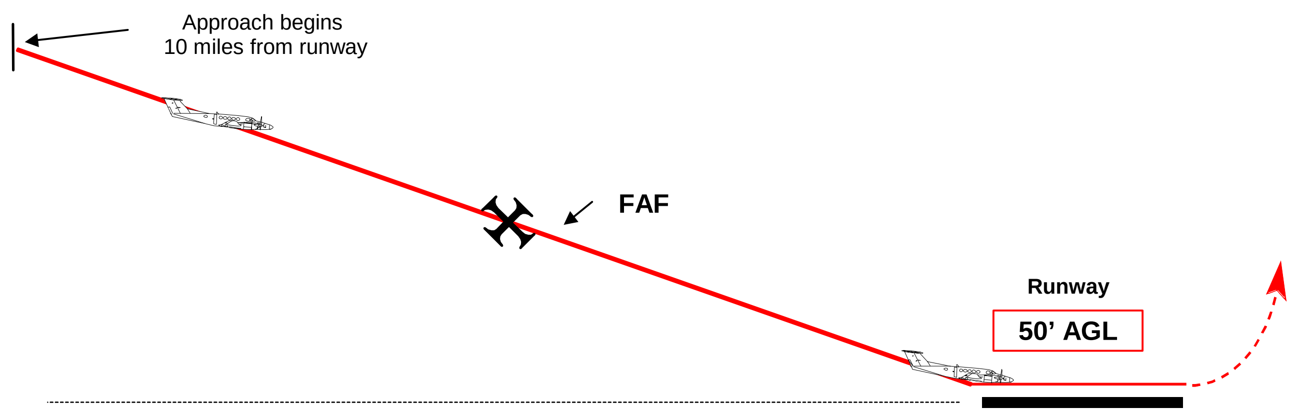
D. ILS-3 MODE

ILS-3 Mode measures localizer and glidepath modulation, structure, signal strength, alignment, and angle. Mean Path Width and symmetry are calculated from data collected in this mode. Marker beacon widths are also measured in the ILS-3 Mode.

(1) AFIS Setup: Set and confirm transmitter configuration. Coordinate with the pilot which runway update method will be used. The TVPS shall be used if the aircraft is so equipped, the system is available, and environmental conditions permit (runway markings, snow, etc.)

(2) Maneuvering: Stabilize the aircraft inbound on-course/ on-path from the FAF or 6 nm, whichever is further from the threshold and terminates at the departure end of the runway. All ILS-3 Mode maneuvers shall be flown coupled in the approach mode to the extent allowed by the Aircraft/ Autopilot Limitations Handbook and TI 4040.50 (This does not preclude manually flying all ILS facilities in the event of coupling problems or other unusual circumstances.). Continue the approach down the full length of the runway, 50 to 100 ft above the runway. Standard runway updates are from threshold (green lights) to runway end (red lights), unless otherwise stated on the facility data sheet. If any doubt exists, compare runway length with threshold displacement information on the facility data sheet.

"FLIGHT INSPECTION LOW APPROACH"
ILS/MLS Front or Back Course



Intercepting the glidepath 500 ft above FAF altitude will allow the aircraft to be stabilized on the approach when transitioning and measuring the Outer Marker. The aircraft must be stabilized on the localizer outside of the FAF to execute VP check on one transmitter.

(3) Monitor Checks: The ILS-3 Mode is used to check general parameters of the facility's overall operating condition. Glideslope angle, localizer alignment, structure, and modulation of facilities are monitored in this mode. Raw data collection for below path clearance runs during commissioning checks may also be accomplished in this mode.

NOTE

Localizer alignment monitors are performed by maintenance request only on FAA and non-Federal facilities. Other maintenance activities may require localizer alignment monitor checks IAW FAA Order 8200.1, Section 217.

(a) Localizer Alignment Monitor Reference Limits: Localizer alignment monitors may be checked airborne or on the ground. The preferred method is on the ground on runway centerline at least 3,000 ft from the localizer antenna. Monitors may be checked airborne during an ILS-3 run using the following procedures.

1 Start AFIS data collection at least 5 nm from the threshold. Select heading mode and maintain a constant heading or align the aircraft to the runway centerline (except for offset localizers) by visual cues.

2 Between 3.5 and 1.5 nm from the threshold, request a course shift to the reference limit in each direction and then restored to Normal. Alarm shifts must be completed and the facility in Normal by 1.5 nm to allow AFIS to measure alignment properly.

3 Identify the normal and course shifts with pilot centerline event marks.

4 The average reference limit values will be determined by analysis of the Zone 2 corrected error trace. The baseline for corrected error trace is referenced to the actual alignment. Displacement of alarm shifts on the error trace is reported as alarm shifts.

(b) Equality of Modulation: Equality of modulation may also be used IAW FAA Order 8200.1, Section 217.

Dual Frequency Localizers:

(1) Disable clearance channel on dual frequency system

(2) Dummy load Course SBO

(3) Aircraft may be positioned anywhere on the front course; establish a normal setting of modulation balance

(4) Instruct maintenance to shift alignment to facility alarm reference point on both sides of centerline (annotate alarm point on recording) and return facility to normal.

(5) Reference the instantaneous shifts to alarm from normal mod. bal. ref. for reporting purposes.

(4) Fix Update: There are three methods the AET may select to update the aircraft position, "AUTO" (TVPS default mode), "MAN" (TVPS), and "PILOT". Regardless of the update mode, close attention must be paid to assure position update accuracy. Crews should be aware of displaced thresholds, runway ends, or other non-standard conditions affecting position update points. When updating over runway, the altitude will normally be around 50 ft AGL (TCH) at runway threshold and should not exceed 100 ft AGL at runway end. The pilot should provide event marks when on visual centerline between 1 nm and threshold as a backup to AFIS and to help detect any AFIS malfunctions.

NOTE

Poor aircraft positioning/ updates will cause erroneous results in facility parameters. Refer to Section 1, Paragraph G(4) if manual fix updating is required.

(a) "TVPS" Mode: A normal ILS-3 approach is flown. No crew input is needed until after passing the departure end of the runway (a pilot event mark at runway threshold and ends is helpful in later analysis. Pilot updates are required to make the “TV” or “PLT” option available during the EXEC FIX phase of low approach.) When the runway threshold is displayed, align the expanded portion of the TVPS cursor to the center of the runway. Then move the cursor to a point where the small "t" end aligns with runway threshold (keeping cursor on runway centerline). When satisfied with the cursor placement, the "ENTER" key will bring up the departure end of the runway. The same process is used to center the cursor on runway end, followed by "ENTER" key. Move the cursor over "EXEC FIX". Pushing the "EXEC SPD" will enter both fixes and start the corrected error trace printout. Prior to “EXEC FIX” after ILS-3 Low Approach, the AET may highlight the “TV” block on the ILS-3 NAV TEST CTRL DATA Page to toggle between “TV” or “PLT” update position at Threshold (TH) or Runway End (RE), respectively. (The Pilot must have activated the RUNWAY UPDATE switch at TH and RE for this option to be available). Once the position update method has been selected, “EXEC FIX” will start data reduction.

NOTE 1

TVPS is the default mode, and data reduction will start by simply highlighting "EXEC FIX" and pressing "EXEC SDP".

NOTE 2

"EXEC SPD" on 'THFIX" or "REFIX" allows the operator to realign the cursor over respective updated points.

(b) "MAN" (Manual TVPS) Mode: The pilot must activate the TVPS camera to capture runway images. This is accomplished by pressing the "RUNWAY UPDATE" button 1 -2 seconds (400 – 500 ft) prior to crossing the runway threshold and again at the runway end. TVPS captures 800 ft of pictures when the "RUNWAY UPDATE" button is depressed. After crossing the runway end, fix points are entered using the process described in the TVPS paragraph above.

(c) "PILOT" Mode: The right-seat pilot will actuate the "Runway Update" button while crossing the runway threshold or displaced threshold, then again at the runway end. The left-seat pilot will provide the AET with an estimate of lateral position from the centerline, i.e., 5 ft left or right of centerline at both ends of the runway. The AET will enter the lateral displacement at threshold and runway end and "EXEC FIX", as in TVPS Mode, to start the corrected error printout.

(5) Evaluation Constraints: The ILS-3 glidepath angle measurement accuracy is extremely dependent on proper aircraft positioning and fix update marking. Apply the following constraints before accepting ILS-3 glidepath evaluation results:

(a) Position the aircraft within 22.5 μA of the "on-path" throughout 95% of Zone 2,unless the path characteristically exhibits structure of greater magnitude.

NOTE

This also applies to the 75 μA displacement for Mean Path Width determinations

(b) During commissioning or special inspections for an angle change, use the average of no less than two consecutive runs with 0.05° or less difference to determine the reliability of the AFIS system. If ILS-3 glidepath angles are not repeatable within 0.05°, terminate the inspection until the cause of the non-repeatability can be determined.

(c) When making Clearance Below Path checks, select a plot calibration expected to keep the raw crosspointer trace on the recording for the complete run. Keeping the crosspointer visible on the plotter affords accurate microamo analysis.

(6) Glide Slope Mean Width and Symmetry (ILS Offset Unit): The ILS-3 Mode may be programmed to measure mean path width and symmetry throughout Zone 2.

(a) Pilot Setup: Using the ILS Offset Unit, selection of the up or down arrow will cause the cockpit CDI to indicate "on-path" when the aircraft is either 75 µA above or below path, respectively.

(b) AET Setup: Using the AET’s PDU, on the ILS-3 NAV/ Test Control Page, toggle “GS DIF” from "ON" to "ABV" or "BLW" (75 µA above and below path, respectively). Glide slope deviation indications on the AET's PDU reflect **actual aircraft deviation from "on-path".** The AET will verify the ILS Offset Unit arrow correctly corresponds to the received glide slope crosspointer displacement.

(c) An ILS-3 is flown for each “ON”, “ABV”, and “BLW”, using standard updates (ILS-3 for actual angle may be used for “ON”). Toggle “GS Sym” to Display 3. This shows the AFIS calculated Mean Symmetry of 90 Hz.

(7) Symmetry Correction Factor ILS-3: In those instances when the ILS-2 symmetry is out-of-tolerance but ILS-3 derived symmetry is in tolerance, a correction factor, based upon the difference between the ILS-3 mean symmetry and ILS-2 symmetry values, may be applied to the ILS-2 symmetry values of future flight checks. Use the following procedure to establish the correction factor:

(a) Optimize facility path width to 0.70° ± 0.03°.

(b) Conduct at least two ILS-2 runs and average the results to determine the ILS-2 symmetry.

(c) Determine the mean symmetry

(d) Compute the difference between the ILS-3 mean symmetry and the ILS-2 average symmetry (ILS-3 minus ILS-2) for the correction factor (CF).

Example 1: SYM-3 = 44%; SYM-2 = 33%; 44% - 33% = +11% CF. Future ILS-2 symmetry = 36% + 11% CF = 47% symmetry.

Example 2: SYM-3 = 46%; SYM-2 = 58%; 46% - 58% = -12% CF. Future ILS-2 symmetry = 59% + -12% CF = 47% symmetry.

(e) Document this correction factor on the data sheet and apply the value to future ILS-2 symmetry checks.

(f) Determine a correction factor for each transmitter on dual equipment facilities.

(8) Glide Slope Best Fit Straight Line: FAA Order 8240.47 shall be used for CAT II/ III glide slope angle, RDH, ARDH, and GPI. It will also be applied when CAT I facilities are to be upgraded to CAT II/ III operations. When all other options have been exhausted and it is determined by flight inspection and facility engineers to be advantageous for facility operation, this order may be applied to a CAT I glide slope.

NOTE

GS Transmitter Equality of Modulation and Phasing can affect the results. A skew can affect the announced angle. Keep the path width angle within commissioning tolerances.

(a) Conduct at least 3, **REPEAT 3,** glide slope approaches with similar trends in the AFIS Zone 2 corrected error traces. After each approach, the results are reviewed on the ILS BEST FIT STRAIGHT LINE – LATEST RUN RESULTS; Pg 3 of 4. If the approach is acceptable, enter the run on the next available column on the ILS BEST FIT STRAIGHT LINE – SUMMARY RESULTS, Pg 4 of 4.

(b) If skewing is present in Zone 2 of the corrected error trace, it indicates optimum AFIS aiming point elevation (glide slope height) has not been achieved.

(c) Using the information from Pg 4 of the ILS BFSL – SUMMARY RESULTS, algebraically add the value of “Z2BF DHT” “AVE” to the “GS HGT” “INITIAL” value to obtain the new value of the glide slope height. Use this new value on the AFIS Facility Data Page (round to the nearest foor). Repeat the process (a) thru (c) until the Z2BF DHT average value is < 3 feet.

(d) When Step (c) is satisfied after 3 consecutive runs, the final computed BFSL angle (Z2BF PA Average) is within .05° of the desired commissioned angle, and there is no skew of the Zone 2 corrected error trace, then the GS angle, origination point, and the reference elevation have been optimized.

(e) Using the latest information from Step (d), report the following from “ILS BFSL – SUMMARY RESULTS” page 4 of ILS-3 Mode to the Procedures Specialist and enter in the Remarks of the FI Report:

RDH – The value listed as “TCH/ RDH” in the “INITIAL” column
ARDH – The value listed as “ARDH” in the “AVE” column
GS HGT – The value listed as “GS HGT” in the “INITIAL” column
GPI – The value listed as the “GPI RNG” in the “INITIAL” column

(f) OTHER CONSIDERATIONS:

1 CAT II/ III – The RDH shall be commissioned at 50 – 60 ft

2 CAT I – The RDH requirement is controlled by FAA Order 8260.3, Paragraph 980.

NOTE

If the criteria in Step (e) cannot be met Engineering/ Installation personnel must be consulted to determine if the facility will meet its "Operational Requirements" before attempting to commission the facility.

(9) Front Course Localizer-Only: This procedure is updated similar to an ILS, but the procedure will be flown to at least 100 ft below the published minimum descent altitude (MDA) at the missed approach point (MAP). If the Zone 2 or 3 localizer structure is out of tolerance and the aircraft was at an altitude greater than 100 ft below the MDA at the MAP, the run must be re-flown to verify facility performance.

(10) Offset Localizer: This facility is evaluated in the ILS-3 Mode. The autopilot must be disconnected at a sufficient distance to allow the aircraft to be manually flown to the runway threshold for standard runway updates.

(11) Back Course Localizer: Back course alignment and structure measurements are derived using ILS-3 Mode. When TEST on the ILS-3 NAV/ TEST CONTROL DATA Page is toggled to BACK, FC ALN on the ILS FACILITY DATA Page changes to 2.0 nm to 1.0 nm for BC alignment. The aircraft's profile in acquiring the data is similar to the front course localizer-only procedure. Sensitive autopilot response in the proximity of the localizer antenna may require disconnecting the autopilot at or prior to 0.5 nm from the antenna. The aircraft should be flown visually to the runway centerline to prevent excessive course aberrations and to enhance aligning the aircraft to the centerline. Runway fix update point is the same physical location as the front course, except in reverse order, e.g., first update at front course departure end and second update at front course threshold (displaced if applicable). Altitudes for executing both fixes should be between 50 and 100 ft AGL. Out-of-tolerance conditions should be verified by a second recorded approach.

(12) Pseudo Runways: Some Localizer Directional Aid (LDA) installations are beyond the limits of AFIS operation due to offset from the runways. Some of these facilities may be evaluated using a "Pseudo Runway" with its apparent centerline along the LDA procedural course. The Threshold and/ or Stop End of this runway may be defined by the LDA antenna, prominent landmark, or painted indications on taxiways, etc. AFIS updating is through normal procedures. These installations may require two or more facility data sheets to fully evaluate the system. All pseudo runway data shall be developed or approved by AVN-210/ 230 personnel.

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3. VORTAC OPERATION PROCEDURES

A. GENERAL

The VORTAC mode has the capability to measure all required parameters of the VOR, VOR/ DME, VORTAC, and TACAN facilities in either radial or orbital flight. The minimum traces required for checks are: Crosspointer, Modulation, Signal Strength/ AGC, ID, FI-Mark, Ground Speed, Error Traces, and DME Range Error. The accuracy of the AFIS measurements is dependent on precise aircraft positioning. Position updating is defaulted to the Hybrid Mode for flight inspection; however, the flight inspector may change to a mode necessary to accomplish the mission. AFIS measurements WILL NOT BE MADE within 5 nm of the facility in Hybrid Mode or 10 nm in any other auto position update mode. Hybrid Mode is the preferred mode for flight inspection. All PIC, SIC, and Technician event or update marks shall be labeled. The VORTAC “Plot Control Page” allows the AET to toggle NDB SS, VHF SS, and UHF SS trace on or off. The analog signals are wired directly to the analog input module of the Printer/ Plotter. The VHF function is taken from VHF #3 at the AET’s panel.

B. RADIALS

The aircraft must be coupled to the electronic radial (except the AFIS reference radial) to better evaluate procedural protected areas, flyability, effects of localized interference, ridgeline effect, etc.

(1) <u>AFIS Reference Radial (ARR)</u>:

(a) Select a radial with good structure quality and whose alignment closely matches that of the alignment orbit over the same azimuth. Coupled to the selected RNAV azimuth, evaluate at least a 5 nm segment between 5 and 25 nm Hybrid mode (10 – 25 nm in non-Hybrid Mode.) The announced mean alignment is the ARR alignment.

NOTE

FMS or AFIS computed bearing may be used to navigate. Aircraft using FMS to navigate on the RNAV track for the ARR should verify the FMS is using the same magnetic variation value applied to the facility under inspection.

(b) If in the FI AUTO DME mode, determine an altitude that will provide adequate DME positioning update. Altitudes of 5,000 ft or higher above the site elevation may be required for optimum aircraft position accuracy.

(c) For locations where DME updating is not available (i.e., island or desert), use the FI FAC Manual Update function and fly outbound on that radial; document this procedure on the Facility Data Sheet.

(2) Monitors:

(a) Ground Procedure. This is the preferred procedure for monitor evaluations.

1 Locate a position on the ground, no closer than 0.5 nm, easily accessible [a Ground Checkpoint (GCP) if possible] with steady crosspointer and in-tolerance signal strength. Radio communications with Airway Facilities personnel is also required.

2 Establish alignment, instruct maintenance to shift course to reference limit left and right of course (RMS recorder must be used to document alignment and shift). Return facility to original alignment point.

3 Document checkpoint location for inclusion on the ASIS Data Sheet.

(b) Airborne Procedure:

1 Establish the ARR normal alignment.

2 Enter a holding pattern on the ARR, with the aircraft coupled to the RNAV azimuth. Measure the mean alignment along the ARR segment with the course shifted to the reference limit in one direction.

NOTE

Instantaneous shifts measured on the error trace may be used to established monitor limits.

3 Repeat the previous maneuver; i.e., (2)(b)2, with the course shifted to the reference limit in the opposite direction.

4 The course shifts are to be referenced to ARR normal alignment for reference limits.

5 Restore the facility to Normal and verify that the mean alignment of the ARR segment is within the established reference limits.

(3) En Route: Inspect the radial(s), either inbound or outbound, throughout its intended use, for the mean alignment, structure, signal strength, and other required parameters.

(4) Terminal: With the exception of TACAN null checks, all terminal radials shall be evaluated in the direction of intended use.

(5) Final Approach Radials: Evaluate the final approach segment for flyability and capability to deliver the aircraft to the designed "Aiming Point." Record and evaluate all required parameters. Do not use the AFIS for alignment within 5.0 nm of the facility in Hybrid or 10.0 nm in non-Hybrid Mode. An Event Mark shall be made at the MAP and minimum altitude flown at the MAP annotated on the recording. Evaluate the missed approach radial IAW Order 8200.1, Section 214.

(6) Restrictions: A restriction defines an area of unusable signal. When out-of-tolerance (OT) conditions are found during orbital evaluation, it will also be verified by radial flight. Report restriction CW, including distance and altitude as: From 127 to 183, Byd 12 Below 5500. Restricted areas are generally not smaller than 10° segments.

(6) VTAC Receiver Deviation Status: The Bearing Status (BRG STATUS) traces for the VOR, TACAN, and DME are available in all VTAC modes, respectively. These traces were added for engineering analysis of receiver malfunctions; however, they may be used to aid the technician in analyzing facility operation and troubleshooting during a flight check via trace deflections during VOR or TACAN azimuth unlocks. Application of Order 8200.1 will be the determining factor when assigning facility status. Loss of TACAN raw crosspointer action represents the azimuth unlock criteria in Order 8200.1, Section 201. The run should be reflown to verify proper facility operation. A DME unlock, per Order 8200.1, Section 201, is indicated by loss of DME RNG and RNG ERR on the Plasma Display Unit (PDU) and/ or loss of the RNG error trace on the plotter.

C. ORBITS

The AFIS will measure alignment and structure throughout 360^0 of azimuth. An orbit may be stopped using the CMD line and EXEC CMD function for collection of data of a partial orbit.

(1) The minimum alignment orbit radius is normally 5 nm (10.0 nm in non-Hybrid Mode) at an altitude that will provide an angle of $4^0 – 6^0$ above the site. Higher altitudes may be used if necessary for air traffic, engineering and maintenance support, or unusual site conditions. Document the orbit direction, altitude, and radius for subsequent inspections.

Orbit Altitude Calc: TL = (TAN θ)(Dist Ft); EC = $(\text{Dist NM})^2$ X (0.8833)

Orbit Altitude = TL + EC + Site Elev.

[θ = angle above site; Dist = orbit radius; EC = earth curvature; TL = tape line]

(2) A coverage orbit shall be flown 1,000 ft (2,000 ft mountainous terrain) above site elevation and intervening terrain. A 1:500,000 ft scale map should be used for evaluating obstacles and intervening terrain when determining the correct coverage altitudes to be flown.

CHAPTER II. AIRCRAFT OPERATIONS

4. RADIO NAVIGATION (RNAV) PROCEDURE

A. GENERAL

This section is to support GPS, VNAV, FMS (DME/ DME), WAAS, and LAAS.

B. GPS OPERATIONAL PROCEDURES

(1) Inspection of GPS-supported RNAV non-precision, stand-alone instrument approach procedures will be in accordance with Order 8200.1, Section 209. Cockpit indications of GPS abnormalities while flying any approach segment will require further analysis using AFIS. When further analysis is required, use procedures below.

(1) Start the AFIS outside the IAF and document the following parameters during all phases of flight.

Parameters	Expected Value
HDOP	1.0 - 4.0
VDOP	1.0 - 4.0
HFOM	Less than 22 meters
Satellites in view (PRN)	5 minimum
SNR	30 db/Hz minimum
DME (supported waypoint)	Minimum -80 dbm

NOTE

There are no flight inspection tolerances applied to these parameters. However, the values listed above provide a baseline for analysis of any GPS signal anomalies or interference.

(2) AET:

(a) Select the Global Positioning System Non-Precision (GPS-NP) MODE from the Service Page.

(b) Select FACILITY DATA; enter data from the AFIS database or manually enter data from the ASIS datasheet.

NOTE

Data for an Original Procedure may not be available in the AFIS database. If data is resident, check correctness using the applicable ASIS airport data sheet. Resident data may be associated with a GPS overlay approach and not consistent with correct data for the inspection of an original procedure.

1 APT ID: 4 letter ICAO Airport Ident, i.e., KOKC would be entered for Oklahoma City, OK.

2 RWY ID: The airport runway ID, i.e., 35L.

3 TH LAT: LAT for the threshold of the approach runway.

4 TH LON: LON for the threshold of approach runway.

5 TH-HGT: Threshold elevation

6 RE-HGT: Runway end

7 RW LEN: Landing length

8 RWY BRG: Runway bearing

9 MAGVAR: Magnetic variation

(c) When the FACILITY DATA PAGE is executed, the AFIS PDU will default and display the GPS-NP NAV TEST CTRL DATA (Page 1 of 2). This is the primary page to start the AFIS operation, observe navigational data, and display the announced corrected results of the approach. Page forward displays the GPS FLIGHT PLAN (Page 2 of 2).

NOTE

After the pilot enters the appropriate waypoint and activates the flight plan, the information will be automatically transferred to the AFIS PDU.

(d) Align the cursor with a waypoint, using the toggle function; assign the appropriate designation to the waypoints presented (not all waypoints require an entry). Toggle between IAF, IF, FAF, MAP, MAPH, or blank to select. When completed, move cursor down to empty line and EXEC PAGE.

NOTE

When the FLIGHT PLAN PAGE is executed, the AFIS PDU will default to the GPS-NP NAV TEST CTRL DATA (Page 1 of 2). The system is now set for AFIS flight inspection analysis of a GPS-NP approach.

(e) Verify the Procedural/ Design Database integrity by observing the AFIS bearing and distance from each waypoint to the next in the flight plan and compare to the corresponding segment of the procedure. Apply the tolerances in Order 8200.1, Section 209.

C. RNAV (DME/ DME) OPERATIONAL PROCEDURES

DME/ DME flight inspection operations are to verify coverage and accuracy of DME facilities. The evaluation is for RNAV procedures, which can be supported by the DME facility ground infrastructure. Detailed operation of AFIS is described in TI 4040.55, the DME/ DME Section.

(1) The DME/ DME mode is a sub-mode of WAAS mode. To activate DME/ DME, go to the WAAS NAV TEST CONTRL DATA Page near the bottom of the first column. DME/ DME must be toggled to YES. During DME/ DME checks, “HYBRID” mode for positioning is required.

(2) The facility under inspection is designated and loaded by airport and runway. P-RNG and P-BRG is then displayed to Runway threshold.

(3) When the pilot loads and activates the flight plan, it may be accessed on Page 2 of the WAAS NAV TEST CONTROL pages. On this page, the waypoints may be given designators by toggling the cursor in front of the fix name. Available operations are: IAF/ IF/ FAF/ RDP/ MAHP/ MISC or blank.

(4) When a FAF is designated, the AFIS will auto-select; load and display 5 DME facilities on Page 3 of the DME/ DME NAV TEST CTRL DATA Page. The DME(s) may then be changed, or if no FAF is designated, the DME(s) may be manually entered. In most cases, the procedure package will list the DME(s) to be checked. Any ILS/ DME(s) should be replaced with a VDME or VTAC before the inspection begins.

NOTE

On a public use VTAC, the DME from the TACAN should be considered. Military TACAN (DME) will not be used for RNAV positioning.

The TYPE entry line allows you to toggle between APPROACH and DEPART. This will help in later interpretation of recordings but has no effect on recording parameters.

(5) During flight inspection of a departure procedure, the AFIS should be started on takeoff roll. The AET should be familiar with the plot configuration to closely monitor all facilities under observation. Flight check results are to be sent to AVN-210 for distribution.

D. RNAV (WAAS and LAAS) OPERATIONS

(RESERVED)

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5. MLS OPERATION PROCEDURES

A. GENERAL

MLS flight inspection maneuvers are similar to ILS; the AFIS is programmed using the ICAO 4-character airport identifier and the MLS runway number. The MLS monitor profile differences will be covered in the following paragraphs. The minimum printer/ plotter traces for all modes are AZ and EL Deviation, PFE, PFN, CMN, Range Error, Signal Strength, Ground Speed, Radio Altimeter, and FI Marker. All PIC, SIC, or AET event marks should be labeled. At the beginning of the inspection, print the data pages containing the expected and decoded data words.

NOTE

You must be within the facility proportional guidance area to print the data words.

When checking the FI MLS FACILITY DATA Page, “MLS TYPE” should be toggled to the proper category of operation Collocated, Straight-in, or Autoland.

B. MLS-1 MODE

This maneuver is used to establish reference arc and proportional guidance throughout the service volume. The AET must ensure settings for azimuth limits; the standard is 40° left and right of centerline. This may vary due to installation requirements; AIRNAV facility data will specify azimuth limits. The MLS-1 arc is basically a coverage check to ensure azimuth, elevation, and DME guidance is available throughout the lateral service volume. Manually analyze the AZ/ EL deviation traces and the DME Range Error per Order 8200.1 tolerances. Disregard announced AFIS, PFE, PFN, and CMN PASS/ FAIL

(1) AFIS Setup: The AET will program the AFIS for facility configuration, arc direction, front/back course, measurement parameters, and arc distances. The pilot will program flight plan functions.

(2) Maneuvering: Program and couple the autopilot to AFIS for evaluation of the azimuth, elevation, and DME facilities along an arc. The arc must be started outside the coverage limit shown on the data sheet and set on NAV/ TEST & CTRL DATA. The crosspointer will step every 10° of the arc during the crossing.

(3) Reference Arc: A Reference Arc is established during commissioning inspections. The altitude shall be recorded on the data sheet for use during subsequent inspections.

(4) Fix Updating: Updating is accomplished with no crew actions required. Refer to Section 1, Paragraph G(4) if manual fix updating is required.

C. MLS-2 MODE

The MLS-2 level run is flown in establishing service volume and coverage for both the elevation and azimuth. The level run will also be used to validate any excessive signal aberrations of the crosspointer found during service volume and coverage checks.

(1) AFIS Setup: The AET will record PFE, PFN, and CMN, checking elevation and azimuth to detect multi-pathing and/ or signal shadowing.

(2) Maneuvering: This maneuver starts at the service volume or ESV, whichever is furthest from ARD. The start altitude shall be computed to equal the MGP x 0.75 at the FAF. Altitudes up to the MGP are acceptable outside the FAF to maintain signal integrity. Inside the FAF, the altitude shall be no higher than that equal to MGP x 0.75 at the FAF. On reaching this altitude, maintain it, observing the elevation crosspointer for a smooth linear transition terminating between 15°- 20° above elevation facility.

(3) Fix Updating: Updating is accomplished with no crew actions required. Refer to Section 1, Paragraph G(4) if manual fix updating is required.

D. MLS-3 MODE

This mode is used to measure the azimuth, elevation, and DME accuracy on the designed procedural azimuth, including Path Following Error (PFE), Path Following Noise (PFN), and Control Motion Noise (CMN) for both facilities. Azimuth Mean Course Error (MCE) or elevation Mean Glide Path (MGP) shift from Normal shall be reported to maintenance and documented on the flight inspection report. However, these values are not tolerances. The worst PFE value throughout the approach, with the MLS at the AZ/ EL respective reference alarm points, is the “GO/ NO-GO” tolerance.

(1) AFIS Setup: When available, TVPS shall be used for the update method. Other methods may be used if adequate visual cues exist. In addition to the minimum traces for the printer/ plotter, PFE, PFN, and CMN will be recorded. **Enter on the facility data page the MAP to TH distance for MMLS and offset azimuth facilities.**

(2) Maneuvering: This check is made on path, on course from FAF or 6 nm, whichever is further from the threshold. The pilot should also give event marks on centerline from 1 nm into threshold for later analysis of recordings. Intercept the glide path 500 ft above FAF altitude to allow for aircraft stabilization. Evaluate azimuth and elevation facilities to the ARD when the azimuth is sited on centerline. All other facilities are evaluated to 100 ft below DH.

(3) Monitors: Azimuth and elevation reference monitors are established after MCE and MGP have been optimized to ± 0.02° of desired commissioning values. High and low angle references +.10° and -.10°, respectively, shall be requested on commissioning. RF power monitor references are to be checked to coverage limits or ESV, whichever is greater.

(4) Fix Update: There are three methods the AET may select to update the aircraft position-- "AUTO" (TVPS default method), "MAN" (TVPS), and "PILOT". Regardless of the update mode, close attention must be paid to assure position update accuracy. Crews should be aware of displaced thresholds, runway ends, or other non-standard conditions affecting position update points. Poor aircraft positioning will cause erroneous results in facility parameters. Refer to Section 1, Paragraph G(4) if manual fix updating is required.

"TVPS" Mode: A normal MLS-3 approach is flown, and no crew input is needed until after passing the departure end of the runway (a pilot event mark at runway ends is helpful in later analysis). When the runway threshold is displayed, align the expanded portion of the TVPS cursor to the center of the runway. Then move the cursor to a point where the small "t" end aligns with runway threshold (keeping cursor on runway centerline). When satisfied with the cursor placement, the "ENTER" key will bring up the departure end of the runway. The same process is used to center the cursor on runway end, followed by "ENTER" key. Move the cursor over "EXEC FIX". Pushing the "EXEC SPD" will enter both fixes and start the corrected error trace printout.

NOTE

***"EXEC SPD" on "THFIX" or "REFIX" allows the operator to realign the cursor over the respective update points prior to "EXEC FIX", starting data reduction*.**

"MAN" (Manual TVPS) Mode: The pilot must activate the TVPS camera to capture runway images. This is accomplished by pressing the "RUNWAY UPDATE" button 1 - 2 seconds prior to crossing the threshold and again 1 - 2 seconds prior to crossing the runway end. After crossing the runway ends, fix points are entered using the process described in the TVPS paragraph above.

"PILOT" Mode: The right-seat pilot will actuate the "Runway Update" button while crossing the runway threshold or displaced threshold, then again at the runway end. The left-seat pilot will provide the AET with an estimate of lateral position from the centerline, i.e., 5 ft left or right of centerline at both ends of the runway. The AET will enter the lateral displacement at threshold and runway end and "EXEC FIX" as in TVPS Mode to start the corrected error printout. When updating over runway fixes, the altitude should normally be 50 ft AGL at runway threshold and should not exceed 100 ft AGL at runway end. The pilot should provide event marks when on visual centerline between 1 nm and threshold as a backup to AFIS and to help detect any AFIS malfunctions.

E. MMLS

Military MMLS collocated facilities shall be commissioned using either the RTT or TVPS. A Commercial Microwave Landing System Avionics (CMLSA) receiver or appropriately modified flight inspection aircraft will be used at commissioning to certify the approach procedure. This is usually accomplished by the PIC performing the commissioning of the facility, observing the procedure while flying in a USAF C-130 equipped with CMLSA.

(1) Azimuth: There are now three ways to verify the alignment of MMLS azimuth alignment. The pilot will couple the autopilot to the CMLSA receiver (if equipped), NCO (Revision L or later), or fly a pseudo runway centerline for runway fix updates. The STD/ NCU switch in the cockpit simulates CMLSA and allows certification of procedures.

(a) Revision L and later revisions add the capability to fly actual runway centerline to determine azimuth alignment. The aircraft is flown to the actual runway, transitioning to visual centerline when the azimuth signal starts to take the aircraft away from visual runway centerline. Updates are accomplished using standard methods for MLS-3.

(b) The AZ facility alignment may be inspected using the updates over the pseudo runway when actual runway results are suspect.
Pseudo Runway: Maintenance will place markers on bore site of the azimuth antenna offset from actual runway centerline perpendicular to the threshold and runway end. Markers can be of any material or object that will allow it to be identified using the TVPS camera. Updates are accomplished over markers using standard methods for MLS-3.

(c) MMLS (STD-NCU): The pilot activates the MMLS (STD-NCU) function, selecting NCU. The AET will observe the MMLS line changing from “DISENGAGE” to “ENGAGED” on the (AFIS) MLS #3 NAV/ TEST CTRL DATA page. The cockpit CDI now displays a NCU-generated centerline indication to the actual runway. NCU is now computing azimuth alignment using offset calculations; normal threshold and stop-end-of-runway updates are used.

CAUTION

THE CREW MUST ENSURE THE MMLS FUNCTION SWITCH IS RETURNED TO “STD” POSITION BEFORE ATTEMPTING ANY OTHER CHECKS.

(d) Azimuth MCE or elevation MGP shift from normal shall be reported to maintenance and documented on the FI report. However, these values are not tolerances. The worst PFE value throughout the approach, with the MLS at the AZ/ EL respective reference alarm points, is the “GO/ NO-GO” tolerance.

(2) Elevation: The EL facility will be inspected using the updates over the actual runway. The angle is measured by flying the elevation and azimuth signal from the FAF or 6 miles, whichever is greater, inbound to the runway threshold. The pilot will transition to visual runway centerline when the azimuth signal starts to take the aircraft off the straight-in ground track to the runway threshold. Updates are accomplished using standard methods for MLS-3.

(a) The Military MMLS Approach Azimuth Area is defined as encompassing:

1 From the AZ facility, along the boresite, extending to the service volume.

2 From the runway centerline extended, starting at the MAP and ending at the service volume.

3 A bearing from the AZ facility to the MAP.

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CHAPTER II. AIRCRAFT OPERATIONS

6. PAR/ VGSI OPERATION PROCEDURES

A. GENERAL

PAR/ PAPI Mode is for analysis of Precision Approach Radar (PAR) and Visual Glide Slope Indicator (VGSI) systems. The AFIS PAR/ PAPI Mode will provide the operator with path angles, course deviation, and course coverage limits. The PAR/ PAPI mode may also be used to check VASI, Pulse Light Approach Slope Indicator (PLASI), and other VGSI type systems.

B. PAR MODE

(1) The PAR function will provide the operator with average path angle and course alignment. Enter threshold coordinates, height of touchdown zone (PAR HGT), commissioned angle (PAR PA), Ground Point Intercept to Threshold Distance (GPI-TH) from data sheet as PAR to Threshold Distance (PAR-TH DIS) on the AFIS PAR Facility Data Page. (Threshold data is found on the airport data sheet.)

(2) Aircraft should be on path and on course outside of 5 nm, making a full low approach using TVPS or PILOT updates at threshold and runway end. AFIS should also be started before 5 nm.

(3) The ON-PATH and ON-COURSE calls from the ground controller are entered by the pilot pressing the LORAN button, or calling “ON”, and the AET pressing the ON-PATH key via the AFIS keyboard. A maximum of 18 path or course calls is allowable. An on-path or on-course input can be deselected from the final calculation if desired (this is done before EXEC FIX after runway updates). Place the cursor on the data to be deselected and toggle (TOG SPD); an “X” appears in front of the data indicating it is not used in the calculation of the angles or course. After the runway fix updates are entered and AFIS is at Data Reduction Status 12, the calculations are complete.

(4) Lateral coverage shall be completed IAW Order 8200.1, Section 216. Using the AFIS coverage angle capability in the PAR/ VGSI mode is the preferred method. Load AFIS Facility Data Page; ATC will provide distance and altitude of expected coverage. Fly the requested arc clockwise or counterclockwise, starting AFIS data collection outside of expected coverage limit. Press the "ON COURSE" key when the radar operator calls the first hit centerline and when radar reply is lost. If radar target is lost before reaching expected limit, reversing the arc may be required to define the limit at target acquisition.

C. VGSI FUNCTION

(1) Lateral Coverage: Lateral coverage is measured by flying either a clockwise or counterclockwise arc at approximately 4 nm at the "ON-PATH" altitude. AFIS should be started outside the expected coverage area. The pilot will tell the AET when he observes the lights as usable, pressing the "ON COURSE" key at first call, centerline call, and when the lights are no longer usable. If coverage is lost before reaching the expected limit, reversing the arc may be required to define the limit at light acquisition. The lateral coverage angle will then be displayed on the PAR/ VGSI NAV/ TEST CTRL page.

(2) Angle Measurements: Two methods of angle measurements are available and are used for specific purposes.

(a) VASI and other VGSIs except PAPI:

1 Level Run. From a distance where a definite below path indication is visible, fly at a constant altitude and airspeed inbound. Using the AET's ON-PATH key or co-pilot's LORAN WPT button, "Event" the AFIS at the last "BELOW PATH", first "ON-PATH", last "ON-PATH", and first full "FLY DOWN" indications. Descend and perform normal runway updating. The path angle is the average of the two "ON-PATH" indications. This run is needed to check for normal transitions between indications. Determination of path angle by this method is acceptable for all inspections, including commissioning.

2 On-Path. Descend, attempting to maintain an on-path indication. Using the AET's ON-PATH key or co-pilot's LORAN WPT button, "Event" the AFIS at each time the pilot judges the indication to be "ON-PATH". Execute normal runway updating. The path angle is the average of the corrected ON-PATH angles. This method is acceptable for all inspections, including commissioning.

(b) PAPI: The following instructions assume a four-box system.

1 Level Run. The level run method for PAPI inspections should be used to check for normal sequence of light box color changes. From a distance where all boxes are RED, fly at a constant altitude and airspeed inbound. Using the AET's ON-PATH key or co-pilot's LORAN WPT button, "Event" the AFIS as each box changes from RED to WHITE, then descend and execute normal runway updating. The path angle is the average of the corrected Box B and C angles as displayed in the PATH DATA area of the NAV/ TEST CTRL page. This method of determining path angle is authorized for routine surveillance or periodic type inspections. It shall not be used to set the system path angle on commissioning-type inspections.

2 On-Path Method. The AFIS system VGSI mode can measure each light box separately by toggling the cursor over the box identifier (Box A being the closest to the runway) to select a box for testing. This method, commonly called "Dip and Dive", uses slight changes in pitch attitude to measure the angles at which a box changes from a low to high and a high to low indication. Starting from below-path inbound on-course, fly through the RED-WHITE change then slightly increase the rate of descent to see a WHITE to RED transition of the box under test. Repeat the process to measure at least four transitions in each direction. Ensure that there are an equal number of transitions in each direction. At each transition point, use the AET's ON-PATH key or co-pilot's LORAN WPT

button to “Event” the AFIS. Execute the normal runway updating to get corrected angles. The box angle is the average of all transitions used. Measure both Box B and C individually; the system path angle is the average of the two box angles. This method must be used to set the angle on commissioning-type inspections.

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CHAPTER II AIRCRAFT OPERATIONS

7. SPECIAL OPERATIONS

A. RADIO FREQUENCY INTERFERENCE (RFI)

GENERAL

The flight inspection aircraft that have been equipped with a Direction Finding (DF) RECEIVER/PROCESSOR are used to assist the FAA Frequency Management Office (FMO) in finding RFI.

(1) When Air Traffic Control reports frequency interference on their communication system or Airway Facilities (AF) receives complaints about facility interference, one of the flight inspection aircraft may be dispatched to locate the interference.

(2) The flight inspection technician operating the DF equipment in the aircraft will direct the pilot toward the RFI emanation point. There will often be an AF engineer to assist in identifying the cause of the RFI.

(3) Communication with AF or FCC personnel on the ground may also be required. When the general location is identified, ground personnel with RFI locating equipment may be directed to the area.

B. NAVIGATIONAL AIDS SIGNAL EVALUATOR (NASE) SIGNAL-IN-SPACE EVALUATOR (SISE)

GENERAL

The NASE/ SISE Package is used by facility maintenance personnel to evaluate an ILS or VOR prior to commissioning, or when system operation requires engineering evaluation. The NASE Package will be provided by the facility maintenance organization requesting the support. The aircrew should meet with the facility maintenance personnel for the temporary installation and operations check of the NASE package. NASE test configuration requirements should also be briefed during this meeting. Facility maintenance will request all inspection maneuvers until the task is completed.

C. RUNWAY INCURSION PROGRAM

GENERAL

This program is designed to integrate and coordinate efforts toward decreasing surface incidents, runway incursions, and ground accidents. Aviation System Standards has taken an active role by assigning aircraft and flight inspection crews to inspect airport ramps, runways, and taxiways. Runways to be inspected will be selected by facility maintenance and scheduled through the FICO.

(1) Aircrew Mission Planning:

(a) Contact Runway Safety Programs (www.faa.gov.runwaysafety:Regional Menu) for the regional representative's name and telephone number.

(b) Coordinate with ATC, advising them of inspection requirements and the time required for the inspection.

(c) Compare airport diagrams and the Airport Facility Directory for conflicts or errors.

(d) Review all lighting systems associated with the runway, parallel, and connecting taxiways. Be familiar with all runway markings and airport signage.

(2) Airport Inspection:

(a) Taxi the full length of the runway, observing signage, markings, and lighting. Observe connecting taxiways and condition of markings. The technician shall write down discrepancies, allowing the pilots to give full attention to the inspection.

(b) Results of the inspection shall be forwarded to the FICO within 24 hours. The DFL and flight inspection report will be submitted using standard procedures.

D. RADIO TELEMETER THEODOLITE (RTT) CALIBRATION

GENERAL

This capability has been added to allow for special operations when complete facility data is not available or circumstances require RTT use. This procedure should be applied when an RTT is to be used in certifying a NAVAID for operational use.

NOTE

The RTT should be ground tested prior to flight. Set up the RTT with the transmitting antenna facing the nose of the aircraft.

Theory of Operation: The RTT is used as a perfect ILS/ MLS reference to compare against the facility under test. Once the theodolite is manually aligned to either the vertical (commissioned elevation angle) or horizontal (designed procedural course) reference, the RTT transmits a comparable electronic course to the flight inspection aircraft. Any difference between the RTT and the facility crosspointer action will be measured as ILS/ MLS error. The RTT is calibrated to a predetermined sensitivity off-course in order to provide accurate deflection representative of the aircraft's offset from the reference course. The telemetering capability of the RTT system allows measurement of facility error without requiring the aircraft to remain constantly on-course or on-path.

Calibration of the RTT is facility specific and is required for each approach. The airborne calibration is embedded in the aircraft's AFIS software. Analysis of the RTT error plotter trace is entirely manual. The validity of the RTT error can be verified on each run. Observe the deviation of the RTT crosspointer from baseline throughout the approach. The RTT error deflection equals the facility under test's crosspointer deviation subtracted from the RTT deviation.

PARKER FLIGHT INSPECTION SYSTEM

Note: AFIS and RTT operations can be conducted simultaneously.

Localizer:

1. MISC SERVICE - Select ILS 3 profile
2. SYS PLOT – Select RTT DEV, RTT ERROR, and RTT VLD on Page 2
3. Instruct THEO operator to transmit “0”.
4. I/ O Page
   a. BWD to the RTT Control/ Setup page
   b. TGL RTT Mode to “ILS Localizer”
   c. TGL RTT Calibration to “0”
   d. Execute SPD on “Clear Cal Value?”
5. Start Plotter
6. RTT Control/ Setup page
   a. Observe the “Raw RTT Input” value - Uncorrected RTT output
   b. Execute SPD on “Execute Cal?” - “Raw RTT Input” indicates 0
      - “RTCP” = **5.0** in. on the plotter
7. Instruct THEO operator to go to ½ localizer course width to the operator’s **left**
   - THEO AZ scale = <360°
   - RTT TX = negative degrees
8. RTT Control/ Setup page
   a. TGL RTT Calibration to, “150µA Left” - Observe the “Raw RTT Input” indicates negative number
      - Observe the “RTCP” deflects left
   b. Execute SPD on “Execute Cal?” - “Raw RTT Input” indicates -150µA
      - “RTCP” trace = **2.0** in. on the plotter
9. Instruct THEO operator to go to ½ localizer course width to the operator’s **right**
   - THEO AZ scale = > 360°
   - RTT TX = positive degrees

10. RTT Control/ Setup page

a. TGL RTT Calibration to, “150µA Right”	- Observe the “Raw RTT Input” indicates positive number - Observe the “RTCP” trace deflects right
b. Execute SPD on “Execute Cal?”	- “Raw RTT Input” indicates +150µA - “RTCP” trace = **8.0** in. on the plotter

11. Print INSP Page

At this time the RTT system is calibrated and ready for use.
Instruct the theo operator to return to “0” to track the aircraft.
Manually analyze the RTT error trace IAW FAA Order 8200.1, Paragraph 217.5.
Repeat the calibration procedure inbound for each approach.
The RTT "VLD" (RTFG) trace indicates a valid RTT signal by a deflection to 2.7 inches.
A deflection to 5.0 inches indicates an invalid RTT signal.
*A **left** alignment error will be indicated by a **right** RTT error deflection from the **3 in**. baseline.*

Glide Slope:

1. MISC SERVICE - Select ILS-3 profile
2. SYS PLOT – Select RTT DEV, RTT ERROR, and RTT VLD on Page 2
3. Instruct THEO operator to transmit “0”.
4. I/ O Page.
   a. BWD to the RTT Control/ Setup page
   b. TGL RTT Mode to “ILS Glide Slope”
   c. TGL RTT Calibration to “0”
   d. Execute SPD on “Clear Cal Value?”
5. Start Plotter
6. RTT Control/ Setup page

a. Observe the “Raw RTT Input” value	- Uncorrected RTT output
b. Execute SPD on “Execute Cal?”	- “Raw RTT Input” indicates 0 - “RTCP” = **5.0** in. on the plotter

7. Instruct THEO operator to go to 0.35° above the reference angle	
	- THEO EL scale = 0.35° higher than the reference angle) - RTT TX = +0.35°
8. RTT Control / Setup page	
a. TGL RTT Calibration to, “75µA Above”	- Observe the “Raw RTT Input” indicates positive number - Observe the “RTCP” deflects right
b. Execute SPD on “Execute Cal?”	- “Raw RTT Input” indicates + 75µA - “RTCP” trace = **6.5** in. on the plotter
9. Instruct THEO operator to go to 0.35° below the reference angle	
	- THEO EL scale = 0.35° lower than the reference angle - RTT TX = -0.35°
10. RTT Control / Setup page	
a. TGL RTT Calibration to, “75 µA Below”	- Observe the “Raw RTT Input” indicates negative number - Observe the “RTCP” deflects left
b. Execute SPD on “Execute Cal?”	- “Raw RTT Input” indicates -75µA - “RTCP” trace = **3.5** in. on the plotter

11. Print INSP Page

At this time the RTT system is calibrated and ready for use.
Instruct the theo operator to return to “0” to track the aircraft.
Manually analyze the RTT error trace IAW FAA Order 8200.1, Paragraph 217.5.
Repeat the calibration procedure inbound for each approach.
The RTT "VLD" (RTFG) trace indicates a valid RTT signal by a deflection to 2.7 inches.
A deflection to 5.0 inches indicates an invalid RTT signal.
*A **high** glide slope angle will be indicated by a **right** RTT error deflection from the 3 in. baseline*
*Each **0.1 in. deflection = 0.023°** (.35°/ 1.5 in.)*

MLS Azimuth:

1. MISC SERVICE - Select MLS-3 profile
2. SYS PLOT - Select RTT DEV, RTT ERROR, and RTT VLD on Page 2.
3. Instruct THEO operator to transmit “0”.
4. I/ O Page
   a. BWD to the RTT Control / Setup page
   b. TGL RTT Mode to “MLS Azimuth”
   c. TGL RTT Calibration to “0”
   d. Execute SPD on “Clear Cal Value?”
5. Start Plotter
6. RTT Control/ Setup page
   a. Observe the “Raw RTT Input” value - Uncorrected RTT output
   b. Execute SPD on “Execute Cal?” - “Raw RTT Input” indicates 0
      - “RTCP” = **5.0** in. on the plotter
7. Instruct THEO operator to go to -1.0° to the operator’s **left**
   - THEO AZ scale = 359°
   - RTT TX = -1.0°
8. RTT Control/ Setup page
   a. TGL RTT Calibration to, “1° Left” - Observe the “Raw RTT Input” indicates negative number
      - Observe the “RTCP” deflects left
   b. Execute SPD on “Execute Cal?” - “Raw RTT Input” indicates –1.00°
      - “RTCP” trace = **4** in. on the plotter
9. Instruct THEO operator to go to +1.0° to the operator’s **right**
   - THEO AZ scale = 001°
   - RTT TX = +1.0°

10. RTT Control/ Setup page

a. TGL RTT Calibration to, “1° Right”	- Observe the “Raw RTT Input” indicates a positive number - Observe the “RTCP” deflects right
b. Execute SPD on “Execute Cal?”	- “Raw RTT Input” indicates +1.00° - “RTCP” trace = **6** in. on the plotter

11. Print INSP Page

At this time the RTT system is calibrated and ready for use.
Instruct the theo operator to return to “0” to track the aircraft.
Manually analyze the RTT error trace IAW FAA Order 8200.1, Paragraph 220.5.
Repeat the calibration procedure inbound for each approach.
The RTT "VLD" (RTFG) trace indicates a valid RTT signal by a deflection to 2.7 inches.
A deflection to 5.0 inches indicates an invalid RTT signal.
*A **left or positive** alignment error will be indicated by a **left** RTT error deflection from the 3 in. baseline.*
*Each **0.1 in. deflection = 0.02°** (.2°/ 1.0 in.)*

MLS Elevation:

1. MISC SERVICE - Select MLS 3 profile
2. SYS PLOT - Select RTT DEV, RTT ERROR, and RTT VLD on Page 2.
3. Instruct THEO operator to transmit “0”.
4. I/ O Page
   a. BWD to the RTT Control / Setup page
   b. TGL RTT Mode to “MLS Elevation”
   c. TGL RTT Calibration to “0”
   d. Execute SPD on “Clear Cal Value?”
5. Start Plotter
6. RTT Control/ Setup page

a. Observe the “Raw RTT Input” value	- Uncorrected RTT output
b. Execute SPD on “Execute Cal?”	- “Raw RTT Input” indicates 0 - “RTCP” = **5.0** in. on the plotter

7. Instruct THEO operator to go to 1.0° above the reference angle

- THEO EL scale = Reference angle + 1.0°
- RTT TX = +1.0°

8. RTT Control / Setup page

a. TGL RTT Calibration to, “1° Above”	- Observe the “Raw RTT Input” indicates positive number
	- Observe the “RTCP” deflects right
b. Execute SPD on “Execute Cal?”	- “Raw RTT Input” indicates +1.00°
	- “RTCP” trace = **6.0** in. on the plotter

9. Instruct THEO operator to go to 1.0° below the reference angle

- THEO EL scale = Reference angle – 1.0°
- RTT TX = -1.0°

10. RTT Control / Setup page

a. TGL RTT Calibration to, “1° Below”	- Observe the “Raw RTT Input” indicates negative number
	- Observe the “RTCP” deflects left
b. Execute SPD on “Execute Cal?”	- “Raw RTT Input” indicates -1.00°
	- “RTCP” trace = **4.0** in. on the plotter

11. Print INSP Page

At this time the RTT system is calibrated and ready for use.
Instruct the theo operator to return to “0” to track the aircraft.
Manually analyze the RTT error trace IAW FAA Order 8200.1, Paragraph 220.5.
Repeat the calibration procedure inbound for each approach.
The RTT "VLD" (RTFG) trace indicates a valid RTT signal by a deflection to 2.7 inches.
A deflection to 5.0 inches indicates an invalid RTT signal
*A **high** elevation angle will be indicated by a **left** RTT error deflection from the 3 in. baseline*
*Each **0.1 in. deflection = 0.02°** (.2°/ 1.0 in.)*

SIERRA FLIGHT INSPECTION SYSTEM

Note: AFIS and RTT operations can be conducted simultaneously.

Localizer:

1. Select an ILS-3 profile
2. Select RTT plots and sensitivity
   a. RTT DEVN
   b. RTT FLAG
   c. RTT/ LOC DIFF
3. "ENTER" to select "RTT Localizer Calibration"
4. Select “Perform CAL” - “Two-Point Calibration” screen appears with cursor in the “No Signal Point Calib Value” field
5. Instruct THEO operator to transmit “0” - Verify a value in the No-Signal Point Measured Value” field
6. “Enter key - Cursor goes to “Full-scale Point Calib Value” field
7. Instruct THEO operator to go to ½ localizer course width to the operator's **right**
   - THEO AZ scale = > 360°
   - RTT TX = positive degrees
   - Measured value = positive degrees
8. "Enter" key
9. Select the "Print Screen" function
10. "Enter" key
11. Select "Continue"
12. "Enter" key
13. Start the ILS-3 profile
14. Instruct THEO operator to transmit “0” - RTT DEVN (RDVN) = **7.0** in
15. Instruct THEO operator to go to ½ localizer course width to the operator's **right**
   - THEO AZ scale = > 360°
   - RTT TX = positive degrees
   - RTT DEVN (RDVN) = **11.0** in.

16. Instruct THEO operator to go to ½ localizer course width to the operator's **left**

- THEO AZ scale = < 360°
- RTT TX = negative degrees
- RTT DEVN (RDVN) = **3.0** in.

At this time the RTT system is calibrated and ready for use.
Instruct the theo operator to return to "0" to track the aircraft.
Manually analyze the RTT error trace IAW FAA Order 8200.1, Paragraph 217.5.
Repeat the calibration procedure inbound for each approach.
The RTT Flag (RTT) trace indicates a valid RTT signal by a deflection to 9.9 inches.
A deflection to 12.0 inches indicates an invalid RTT signal.
A left alignment error will be indicated by a right RTT error deflection from the 6 in. baseline.

Glide Slope:

1. Select an ILS-3 profile
2. Select RTT plots and sensitivity
   a. RTT DEVN
   b. RTT FLAG
   c. RTT/ GLS DIFF
3. "ENTER" to select "RTT Glide Slope Calibration"
4. Select "Perform CAL" - "Two-Point Calibration" screen appears with cursor in the "No Signal Point Calib Value" field
5. Instruct THEO operator to transmit "0", - Verify a value in the "No-Signal Point Measured Value" field
6. "Enter" key - Cursor goes to "Full-scale Point Calib Value" field
7. Instruct THEO operator to go to 0.35° above the reference angle
   - THEO EL scale = 0.35° higher than the reference angle
   - RTT TX = +0.35°
   - Measured value = positive degrees
8. "Enter" key
9. Select the "Print Screen" function
10. "Enter" key
11. Select "Continue"
12. "Enter" key

13. Start the ILS-3 profile

14. Instruct THEO operator to transmit “0” - RTT DEVN (RDVN) = **7.0** in.

15. Instruct THEO operator to go to 0.35° above the reference angle

- THEO EL scale = 0.35° higher than the reference angle)
- RTT TX = +0.35°
- RTT DEVN (RDVN) = **9.0** in.

16. Instruct THEO operator to go to 0.35° below the reference angle

- THEO EL scale = 0.35° below the reference angle
- RTT TX = 0.35°
- RTT DEVN (RDVN) = **5.0** in.

At this time the RTT system is calibrated and ready for use.
Instruct the theo operator to return to “0” to track the aircraft.
Manually analyze the RTT error trace IAW FAA Order 8200.1, Paragraph **217.5.**
Repeat the calibration procedure inbound for each approach.
The RTT Flag (RTT) trace indicates a valid RTT signal by a deflection to 9.9 inches.
A deflection to 12.0 inches indicates an invalid RTT signal.
A ***high*** *glide slope angle will be indicated by a* ***right*** *RTT error deflection from the 6 in. baseline*
Each ***0.1 in. deflection = 0.0175°*** *(.35°/ 2.0 in.)*

MLS:

The MLS RTT operation involves the use of the portable MLS flight inspection system as installed as a "stand-alone" non-AFIS system. The operating instructions for the system are contained in TI 4040.52, current edition. The following RTT operation assumes the installation of the portable MLS "package" and the initial RMS-33 plotter set-up procedures have been accomplished.

MLS Azimuth:

1. Select MLS-1

2. RTT CONTROL UNIT;

   a. ON
   b. DISC OFF
   c. CAL OFF
   d. SETUP ON
   e. 75 CAL
   f. AZ

3. RTT THEO AZ "0"

DVM - RTT	**DVM - DIFF**
- ADJUST RTT ZERO POT	- ADJUST DIFF ZERO POT
- DVM ± .001VOLTS	- DVM ± .001 VOLTS

4. RTT THEO AZ +1.0°

DVM - RTT	**DVM - DIFF**
- ADJUST RTT GAIN POT	- ADJUST DIFF GAIN POT
- DVM +.075 VOLTS	- DVM - .075 VOLTS
- RTT **2** IN LEFT (RMS)	- DIFF **2** IN RIGHT (RMS)

5. RTT THEO -1.0°

DVM - RTT	**DVM - DIFF**
- DVM -.075 VOLTS	- DVM - +.075 VOLTS
- RTT **2** IN RIGHT (RMS)	- RTT **2** IN LEFT (RMS)

6. RTT THEO AZ "0"

7. RTT SETUP OFF

*DIFF TRACE DEFLECTS **LEFT** FOR **RIGHT** MLS MISALIGNMENT*
.05°/ LL *@ 37.5 RMS SENS*
Manually analyze the RTT error trace IAW FAA Order 8200.1, Paragraph 220.5.

MLS Elevation:

1. Select MLS-1
2. RTT CONTROL UNIT
   a. ON
   b. DISC OFF
   c. CAL OFF
   d. SETUP ON
   e. 75 CAL
   f. EL
3. RTT THEO ELEVATION "0" DDM

DVM - RTT	DVM - DIFF
- ADJUST RTT ZERO POT	- ADJUST DIFF ZERO POT
- DVM 0 ± .001 VOLTS	- DVM 0 ± .001 VOLTS
- RTT **5** IN BASELINE	- DIFF **6** IN BASELINE

4. RTT THEO EL +0.30° (FROM REFERENCE ANGLE)

DVM - RTT	DVM - DIFF
- ADJUST RTT GAIN POT	- ADJUST DIFF GAIN POT
- DVM +.060 VOLTS	- DVM - .060 VOLTS
- RTT **1.6** IN LEFT (RMS)	- DIFF **1.6** IN RIGHT (RMS)

5. RTT THEO EL -0.30° (FROM REFERENCE ANGLE)

DVM - RTT	DVM - DIFF
- DVM - .060 VOLTS	- DVM + .060 VOLTS
- RTT **1.6** IN RIGHT (RMS)	- DIFF **1.6** IN LEFT (RMS)

6. RTT THEO EL "0" DDM
7. RTT SETUP OFF

*DIFF TRACE DEFLECTS **RIGHT** FOR **HIGH** MLS ANGLE*
***.01875 Deg/ LL** @ 37.5 RMS SENS. Other sensitivities may be used.*
Manually analyze the RTT error trace IAW FAA Order 8200.1, Paragraph 220.5.

PLOTTER TRACE

CONDITION	PARKER	SIERRA
LOC RTT "0"	RTT CP = 5.0 in.	RTT CP = 7.0 in.
LOC RTT CAL Left	RTT CP = 2.0 in.	RTT CP = 3.0 in.
LOC RTT CAL Right	RTT CP = 8.0 in.	RTT CP = 11.0 in.
Localizer CL	RTT ERR = 3.0 in.	RTT ERR = 6.0 in.
Localizer Misaligned Right	RTT ERR = Left	RTT ERR = Left
Localizer Misaligned Left	RTT ERR = Right	RTT ERR = Right
G/ S RTT "0"	RTT CP = 5.0 in.	RTT CP = 7.0 in.
G/ S RTT CAL Above	RTT CP = 6.5 in.	RTT CP = 9.0 in.
G/ S RTT CAL Below	RTT CP = 3.5 in.	RTT CP = 5.0 in.
"0" G/ S Angle Error	RTT ERR = 3.0 in.	RTT ERR = 6.0 in.
G/ S Angle High	RTT ERR = Right	RTT ERR = Right
G/ S Angle Low	RTT ERR = Left	RTT ERR = Left
MLS AZ RTT "0"	RTT CP = 5.0 in.	RTT CP = 5.0 in.
MLS AZ RTT CAL Left (-)	RTT CP = 4.0 in.	RTT CP = 7.0 in.
MLS AZ RTT CAL Right (+)	RTT CP = 6.0 in.	RTT CP = 3.0 in.
MLS AZ CL	RTT ERR = 3.0 in.	RTT ERR = 6.0 in.
MLS AZ Misaligned Left (+)	RTT ERR = Left	RTT ERR = Right
MLS AZ Misaligned Right (-)	RTT ERR = Right	RTT ERR = Left
MLS EL RTT "0"	RTT CP = 5.0 in.	RTT CP = 5.0 in.
MLS EL RTT CAL Above	RTT CP = 6.0 in.	RTT CP = 3.4 in.
MLS EL RTT CAL Below	RTT CP = 4.0 in.	RTT CP = 6.6 in.
"0" MLS EL Error	RTT ERR = 3.0 in.	RTT ERR = 6.0 in.
MLS EL Angle High	RTT ERR = Left	RTT ERR = Right
MLS EL Angle Low	RTT ERR = Right	RTT ERR = Left

1. RTT CP traces are identified by their location on the RMS-33 plotter, in inches.

2. RTT ERR plots are identified by their location on the plot in inches, and by the deflection direction from "0" baselines.

3. "CAL" left and right are referenced to the theodolite operator's left and right.

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CHAPTER II AIRCRAFT OPERATIONS

8. HAWKER/ SIERRA DATABASE MANAGEMENT (BAe-800)

A. GENERAL

This Chapter specifies the use of the Sierra AFIS system as installed in the Hawker BAe-125-800 aircraft, for accomplishing the flight inspection mission.

B. DATABASE OPERATION

The automated database used by the Flight Inspection System (FIS) is guaranteed current only through 1999. Facility additions/ changes since that time must be manually input. The automated database is loaded on a cassette tape via the FIS tape drive assembly.

(1) FMS Database: A separate, independent database is maintained for the Flight Management System (FMS). Since the FIS uses the composite FMS position for initial platform accuracy, a current FMS database must be installed or data verified until a current database is installed. There are two databases available, one for CONUS, and one for overseas locations. Both should be on the aircraft and can be changed by the crew.

(2) FIS Database: The Flight Inspection AET will:

(a) Determine the FIS database is current before beginning a flight inspection mission.

(b) Compare the FIS database to a current ASIS data product for all facilities. Enter corrections to the FIS database when it differs from the ASIS data.

(c) Manually enter data for facilities (ASR, VASI, NDB, Comm, DF, etc.) not normally located in the database.

(d) Print the FIS database form before each inspection and retain it as part of the flight inspection recordings.

(3) Unique Data Base Entries: The Sierra FIS has the unique capability to afford multilateration (DME position updating) based on DME or TACAN facilities hand-loaded into the FIS Data Base. **Use caution when loading questionable data; erroneous entries will degrade FIS multilateration accuracy, inducing errors into the facility under test.**

(4) Magnetic Variation is entered using a **negative** number to indicate **West** slave variation, and a **positive** number to indicate **East** slave variation.

(5) PAR profiles in the FAA database do not include runway length. **This information must be entered in the database, or the PAR results will be inaccurate.**

(6) The "Restriction Flag" requires a three-digit alpha "Y" or "N" input for ILS facilities. No matter which character appears from ASIS data sheet inputs, **always change all characters to "N".** (The database was designed to indicate a "Y" for restricted areas of the ILS front course, back course, and clearance sectors. If left as a "Y", the FIS will not analyze this area).

(7) TACAN "Facility Frequency" requires the paired VOR frequency.

(8) When either the longitude or latitude of a facility is less than one full degree South or East, the screen will default to North and West. **Input the correct facility coordinates from the Airport/ NAVAID data sheet to prevent erroneous facility errors**.

(9) With the exception of the "Restriction Start" block of the ILS database, **all other database numerical blocks must contain an entry**. For a localizer-only or LDA/ SDF facility, enter the threshold coordinates in the "GLS LAT/ LON" block, a "0" in the "GS Threshold Distance" block, threshold elevation in the "GLS ELEV" block, facility to threshold distance in the "GLS LOC Distance" block, and a "0" in the "GLS Published Angle" block. The "0" in the angle block will enable an additional screen prompt for missed approach distance.

NOTE

<u>Contingency Operations</u>*: When adding a DME facility using data not verified by the Flight Inspection Technical Support Branch, it is advisable to load this information to the Supplementary Data Base. Whenever the new facility is used for multilateration purposes, it will be displayed in "inverse video", i.e. highlighted text on the DME page. Only those facilities not loaded to the FAA's Airport/ NAVAID based data base will be highlighted.

C. AIRCRAFT POSITIONING

(1) The aircraft will be flown smoothly to help reduce acceleration loads on the Inertial Reference Unit (IRU). This will minimize IRU velocity errors that contribute to induced errors on the calculated positions of the FMS and FIS systems in the aircraft. The pilot will normally couple the autopilot to the facility being inspected, except for ARR(s) and Orbit/ Arc maneuvers, which will be coupled to the FMS. Manually flying the aircraft is authorized when there are equipment problems, for training, efficiency, etc., unless it adversely affects the flight inspection data.

(2) Each flight inspection profile has a "baro screen", whereby the AET can input current ground temperature, barometer setting, and the MSL altitude of the source of this data. As explained later, this data is critical to ILS-2 profiles. The AET may elect to not enter current settings for Rho-Theta inspections**. If the "Yes" option is selected, the AET must enter current data. Failure to do so will cause drastic DME positioning errors in all profiles.**

D. POSITION ESTIMATION

The position estimation is designed to calculate the aircraft position to within 300 ft, using an automatic Hybrid GPS **multilateration** technique. Hybrid GPS is obtained by manually selecting the #2 TACAN upper antenna. This position "dummy loads" the # 2 TACAN interrogator, inhibiting DME updates otherwise used by AFIS for positioning. **FIS AUTO must be selected for GPS positioning.** Should the GPS system fail, DME updates can be used for multilateration by selecting the #2 TACAN lower antenna. If multilateration is not possible, landmark updates can be made. Accuracy is further enhanced using pilot runway updating for approach type profiles (accuracy in this mode is .01° in azimuth and elevation). The outer marker is also used to automatically update the position during ILS-3 profiles.

(1) Position Initialization: Initialize the IRU to the aircraft's position on the ramp - **not the Airport Reference Point.** Update the aircraft's position again at RWY Threshold if delayed on the ramp, or after a lengthy taxi.

(2) The FMS provides the initial aircraft composite position to the FIS each time the AET enters the flight inspection profile en route screen. The FIS then uses navigation software to compute position, using inertial velocities. The DME multilateration process (if selected) also starts if the aircraft is within 300 nm of the facility (when in FIS AUTO mode). GPS positioning occurs regardless of the aircraft's distance to the facility being evaluated (when in FIS AUTO mode).

CAUTION

IF THE INITIAL POSITION INFORMATION FROM THE FMS IS SUFFICIENTLY INCORRECT, FIS MULTILATERATION MAY NOT OCCUR SINCE THE ACTUAL DME RECEIVED FROM EACH STATION WILL BE INCONSISTENT WITH THE DERIVED FMS STATION DISTANCE; FIS POSITION ERRORS WILL BE SIGNIFICANT.

(3) The Pilot Will:

(a) Ensure the #2 TACAN is placed in FIS Auto or FIS Manual mode, as coordinated with the AET, prior to the start of any flight inspection.

(b) Ensure the GPS (GNSSU) circuit breaker is "in" unless briefed otherwise by the AET.

CAUTION

CHANGING THE #2 TACAN SWITCH SETTING WHILE IN AN INSPECTION PROFILE CAN CAUSE SIGNIFICANT POSITION AND DATA ERRORS, INVALIDATING INSPECTION RESULTS.

(c) If the cockpit GPS is unusable, monitor the FMS sensor pages prior to the AET entering the en route screen. If the VPU sensors are not functional, the composite FMS (and initial FIS) position will be derived from the IRU and GPS position. The initial FIS platform error will be directly proportional to any error in the composite FMS position

(d) Correctly initialize the FMS and IRU prior to take-off. This is particularly important in regions where the VPU(s) may not receive data. When possible, realign the IRS at the runway end prior to take-off, using the "hold feature" of the FMS and the "align" switch on the IRS. When DME/ GPS stations are not available, use landmarks to update the FIS position for non-runway update profiles.

(e) If the cockpit GPS is unusable, update the FMS position when airborne, since the FIS may require a new FMS starting position during the flight. This is especially true during times when the VPU(s) are receiving no updates. Use the hold feature of the FMS over a well surveyed landmark, such as a navigation station or runway end. Verify landmark identification and coordinates with the AET prior to the inspection.

(4) <u>The AET Will:</u>

(a) Initialize the FIS (i.e., enter the en route mode) after confirmation from the pilot that the FMS position is reasonable. Initialize airborne at an altitude where the FMS VPU(s) will update, and surrounding DME stations and satellites can be received. In low DME/ satellite environments, initialize airborne once the FMS position “reasonableness” has been established.

(b) Monitor the performance of the positioning estimation system, and reinitialize whenever the positioning accuracy can be verified as unreliable. Use such indicators as DME and azimuth errors, which cycle as the aircraft completes an orbit, inconsistent and unrepeatable results, and a frozen **"POS"** number. An example would be a DME error which went from + .3 to 0 miles after 90° of orbit and then to -.3 after another 90°. The azimuth error would be at maximum when the DME error would be zero.

(c) Monitor the Current DME/ GPS screen periodically during all flight inspections. The FIS will display all DME(s) and satellites, which may be used for automatic position updating. Only those DME(s) and satellites that are asterisked are currently being used by the FIS.

NOTE 1

DME's with a range error greater than 1,200 ft, GPS Horizontal Dillution of Precision (HDOP) >2.8, or GPS Horizontal Figure of Merit (HFOM) >183 Meters may be unusable for this purpose.

NOTE 2

GPS positioning is accurate only when the Molodensky Constant matches the map datum of the facility coordinates undergoing inspection.

(d) The FIS will not automatically delete a bad DME; the AET must do so by returning to the Database Management menu. GPS positioning, in FIS AUTO mode, can only be de-selected by pulling the GPS circuit breaker. ***The DME (paired VOR) frequency can be changed in the database to that of a non-VOR frequency to prevent the FIS from auto-tuning the facility for multilateration purposes. Using this method, the remaining facility data remains in the database for future reference.***

(e) Determine suitability of aircraft positioning prior to starting any flight inspection.

E. RUNWAY UPDATING

Runway update procedures are used whenever an approach profile is flown for ILS, PAR, ASR, and VASI:

(1) The right-seat pilot will actuate the runway event button and provide the AET with the distance from centerline. Accuracy is critical. (Note: the software compensates for yaw and pitch angles of the aircraft and receiving antenna locations at the time of runway update.)

(2) The left-seat pilot can use the spacing of the threshold markers as an aid to verify deviation from runway centerline.

(3) The right-seat pilot must make the correct runway event marks at the spot that corresponds to the runway threshold and runway end location. Use the threshold marker if it exists, being careful not to mark hard surfaces, such as overruns or abandoned runway surfaces that are not part of the landing runway, or those which precede the actual threshold or follow the departure end.

CAUTION

MARK DISPLACED THRESHOLDS WHEN THEY COINCIDE WITH THE GREEN THRESHOLD LIGHTS. THE DISPLACED THRESHOLD AT THE DEPARTURE END OF THE RUNWAY BEING CHECKED MAY ALSO BE MARKED IF IT COINCIDES WITH RED LIGHTS MARKING THE RUNWAY END.

(4) The runway length in the FIS database should correspond to the length on the approach plate.

(5) The AET must abort the run if the event marks are missed. The FIS must be reinitialized if the runway marks are accomplished incorrectly or if the run is aborted. **Failure to abort to the main menu after incorrect or missed updates will corrupt future profiles.**

(6) A laser in the tail of the aircraft is used to evaluate the ILS-3. The pilot will ensure the "laser conditioning" is enabled in the cockpit. The AET will ensure the laser key is activated on the Operator’s Console. The pilot will fly the aircraft to a height of 33 to 100 ft AGL for execution of runway updates. An asterisk may appear for laser altitude abort (in post-profile results) when the aircraft update is made below 33 ft. The profile shall be re-flown whenever asterisks appear in the position update table. The AET **should** advise the pilot of his reported elevation above the ground until reaching the departure end update. This information is critical to ILS CAT II and CAT III localizer structure evaluations.

(7) The pilot must fly the aircraft as close to centerline as possible. A runway with an edge elevation that is different from the center can result in glide slope errors, since the elevation at the event will not be equal to the elevation in the database.

F. LANDMARK UPDATING

(1) Flight inspection with the Sierra Flight Inspection System can be performed satisfactorily in areas that lack sufficient DME/ satellite updates to operate in the FIS AUTO mode. The key to this operation is frequent "Landmark" updates to the FIS and concurrent "Fix Hold" updates to the FMS. "Fix Hold" updating enhances the LNAV flight track accuracy and, if selected by the AET, will provide a good position to the FIS.

(2) Landmark updating will be used for non-approach profiles when insufficient DME stations **(less than three)** are available, in cases of bad DME geometry, and/or lack of satellite positioning.

NOTE

The FIS will display an error on the VDU whenever less than two DME stations are used for positioning.

(3) Make frequent updates during periods when no DME(s)/ satellites are received, or, if the indicated accuracy is degraded (increased alignment error, POS that has increased significantly, or is frozen).

(4) Make a landmark **<u>at least once per profile</u>** when DME/ GPS updating is totally absent.

(5) Use coordinates which are as accurate as possible. For example, use the facility under inspection or other surveyed points such as other NAVAID(s) or runway thresholds. Coordinates from a chart are satisfactory, if taken far enough from the facility to account for possible survey error. DME landmarks can be used if an approved "NAV" program (Excel, etc.) determines a point in space derived from proven start coordinates. (See procedures in the ILS and Rho-Theta sections for details).

(6) Remember that landmarks will remain on the landmark data screen until the FIS is turned off. Changing facilities or profiles will not clear the landmark screen.

(7) To increase accuracy, execute landmark updates of physical checkpoints at low altitudes. Avoid altitudes above 500 AGL, except for received DME landmarks.

(8) Have suitable landmarks entered on the AMIS product for future use.

(9) To reduce the possibility of FMS composite position error in areas that either lack or have unacceptable DME sources, remove the VLF/OMEGA and VPU inputs to the FMS. This leaves only the IRU input to the FMS; with frequent manual FMS position updating, errors of 1/10th of a minute or less can be realized. This procedure must be accomplished after each FMS initialization, since the sensors default to an active input status upon “power-up”.

(10) If desired, the IRU can be realigned while at the threshold, just before takeoff. This procedure usually takes less than 30 seconds, and will eliminate any velocity errors that have accumulated since initialization.

NOTE

Keep aircraft maneuvering to a minimum while performing FIS MANUAL flight inspection. Avoid steep climbs, descents, and bank angles, as well as rapid acceleration/ deceleration, to reduce the positioning errors generated by the IRU/ FIS and produce more consistent results.

G. THEODOLITE PROCEDURES

(1) Theodolite tones can be received only via VHF 1 radio. The AET must select Group 1 tones on the plotter selection page to activate a small marker on the extreme right side of the plotter. **The “THEO MARK” of the Alternate Capability Unit (ACU) can also be used for ILS inspections only**.

CAUTION

DO NOT USE THE ACU THEODOLITE MARK CAPABILITY FOR ANY NON-ACU VOR OR TACAN INSPECTION. THE FIS SOFTWARE DELAYS THE PLOTTED VOR OR TACAN BRG DEVIATION TRACES FROM THE "REAL-TIME" ACU THEO MARKS.

(2) VOR nose/ tail antenna switch: Located on the right side of the Operator's Console, it is to remain in the "tail" position for all profiles, **except** for inbound VOR radials, when the AET may select the "nose" position.

(3) RTT Procedures: Radio Telemetering Theodolite is available on ILS and Rho-Theta profiles. The RTT "Deviation Error" trace deflection is the same as the localizer and glide slope error traces. **Localizer error trace deflects left for a right localizer misalignment and deflects left for a low glide slope angle.** Calibration is software controlled.

H. DATA RECORDING

The AET Will:

(1) Use the save-to-tape function for ground training and to document repeated system malfunctions during flight inspection (time permitting).

(2) Save the profile in the analysis mode for repeated malfunctions (time permitting). This information will aid in correction of system malfunctions.

(3) Make maximum use of manual recording annotations to either backup or correct automatic.

I. PROFILE DOCUMENTATION

The **AET**:

(1) Should use the profile documentation screens to record the purpose of each run and the results.

(2) May print the profile log and use it as a summary sheet for the inspection.

J. FIS AUTO ILS PROCEDURES

(1) ILS-1 Mode: This mode measures localizer clearance, course width, and symmetry. Displayed distance on the VDU is available from both RWY Threshold and the localizer facility.

(2) Maneuvering: The pilot should fly the aircraft along an arc 10 nm from the facility. Altitude will be the LCA, or altitudes up to ESV, providing comparability checks in accordance with Section 217 of Order 8200.1 have been successfully completed.

(3) Documentation: Tabular results will be reported. Smoothing and post-profile plots are not normally required.

(4) The AET will monitor the facility ident tone in the clearance worst-case condition. Annotate the plot at times when the ID heard is satisfactory, but not decoded by the plotter.

(5) ILS-2 Mode: This mode measures glide slope angle, path width, symmetry, and structure below path. (Note: The mileage that is displayed by the FIS is the distance from threshold.)

(a) Altimeters: The FIS uses precision barometric data, smoothed by the inertial vertical accelerometer, to compute elevation angle. **Errors will be induced by altimeter installation errors, incorrect reference baro data inputs, changes in barometric pressure, and non-standard atmospheric conditions, such as fronts and temperature inversions. In addition, changes in aircraft altitude with the FIS running (diving to get SBP) will also induce ILS-2 angular errors, and should be avoided**. The only control that the crew can apply is to verify altimeter and temperature readings at approximately 15-minute intervals, while maintaining consistent ILS-2 altitudes.

(b) The glide slope width calculations are less affected by differences in position error than are angle calculations.

(c) Monitor the current altimeter setting and temperature during the flight inspection. Enter corrected settings as they occur.

(d) At the AET's option, precede the first ILS-2 with an ILS-3 run to obtain an actual angle correction factor prior to the monitor alarms. This will also provide a position update to the FIS in low DME areas.

(e) Theodolite use is recommended when non-standard engineering type checks, such as glide slope "Zero DDM" and antenna nulls, are performed.

(f) Documentation: Report tabular results. Smoothing and post-profile plots are not normally required.

(6) ILS-3 Mode: This mode measures localizer and glide path modulation level, structure, alignment, actual angle, marker beacon width, and mean path width and symmetry. (Note: The mileage that is displayed by the FIS is the distance from threshold.)

NOTE

Back up FIS announced localizer alignment with pilot centerline marks in Zones 2 and 3. If the localizer is rough in these areas, use the pilot marks to report alignment. Use pilot centerline marks to compute Zones 4 and 5 alignment and structure. AFIS-announced Zones 4 and 5 structure incorrectly uses the alignment from 1 nm from threshold to RWY threshold.

CAUTION

RUNWAY LENGTHS WHICH ARE ACTUALLY LONGER THAN THAT SPECIFIED IN THE ASIS/ FIS DATABASE MAY RESULT IN DEPARTURE END LASER FAILURES. CHECK THE ACTUAL RUNWAY LENGTH AGAINST AMIS/ FIS WHENEVER DEPARTURE END LASER MARKS CONSISTENTLY SHOW ZEROS OR ASTERISKS IN THE LASER UPDATE TABLE (PRESENTED AT THE END OF THE REAL TIME ILS-3 PLOTS).

(7) Localizer Alignment Monitors: Monitors should be checked on the ground whenever possible; however, they may be checked airborne during an ILS-3 run. Use the following airborne procedures.

(a) Start the profile at least 5 nm from threshold. Do not couple the autopilot to the course, since the course will be adjusted during the approach. Maintain a visual centerline with minimum maneuvering.

(b) Request maintenance shift the course to both alarm points as quickly as possible when the aircraft is between 3.5 and 1.5 nm from threshold. Recommended airspeed is VREF + 25 KTS.

(c) Verify the course shifts during alarm on the real-time plots, using the localizer deviation trace.

(d) Calculate monitor alarm results by referencing the post-profile error trace in alarm to the 0µA baseline. Note: Disregard the tolerance box.

NOTE

Offset SDF, LDA, Offset Localizer, and other Localizer (with maintenance concurrence) alignment monitors can be evaluated using an "equality of modulation reference". Program an ILS-3 or ILS-4 FIS mode for this purpose.

(8) Mean Path Width and Symmetry: The ILS-3 mode is programmed to measure mean path width and symmetry in Zone 2. The procedure differs from the on path run in that it is flown 75 µA above and below path. The pilot should select and fly the appropriate offset. Fly three runs to obtain the on-path, above-path, and below-path angles. The FIS uses the last ILS-3 on-path angle flown to compute mean symmetry.

(9) ILS Offset Unit: The primary purpose is to intentionally offset glide slope and localizer readings on associated ILS instruments in the **cockpit** when up, down, right, or left ILS offset is selected by the pilot. For flight inspection purposes, it is used as follows:

(a) Glide Slope Mean Width and Symmetry: Selection of the up or down arrow will cause the cockpit CDI to indicate "on-path" when the aircraft is either 75 µA (.35°) above or below path, respectively. All indications on the AET's VDU and flight inspection console reflect **actual aircraft deviation from "on - path".** The AET will verify the arrow correctly corresponds to the received glide slope crosspointer.

(b) Glide Slope Tilt Check: Selection of the right or left arrow will cause the cockpit CDI to indicate "on - course" when the aircraft is either 150 µA in the 150 Hz or 90 Hz, respectively. Again, the AET's indications are of aircraft displacement--this time from localizer centerline. The AET should verify that the indicated arrow correctly corresponds to the received ILS crosspointer information.

CAUTION

BOTH PILOT AND AET MUST ENSURE THE ILS OFFSET UNIT IS RETURNED TO NORMAL WHEN NOT SPECIFICALLY REQUIRED FOR A FLIGHT INSPECTION MANEUVER.

(10) CAT II- III Glide Slope Structure Analysis: The second corrected error trace stops plotting at Point C (software error), and precludes the use of this trace to compute the glide slope structure from Point C to runway threshold. This requires manually analyzing the first corrected error trace. This procedure is approved for CAT II / III flight inspection.

(11) **Glide Slope Angle Alignment Criteria (Ref Order 8200.1, Section 217).** Manually analyze the first corrected error trace between point B and runway threshold for Category II and III glide slopes.

(12) Localizer Back Course:

(a) The announced AFIS alignment of the back course is reversed. Whereas the micro amp displacement is correct, the AET must report the opposite L/R alignment on the flight inspection report.

(b) Back-course alignment and structure measurements can be derived in this mode. The aircraft's profile in acquiring the data is similar to the front course localizer only approach. Sensitive autopilot response in the proximity of the localizer antenna may require autopilot decoupling at or near 0.5 nm from the antenna. Fly the aircraft with visual cues to the runway centerline to prevent excessive course aberrations and to enhance aligning the aircraft to centerline.

(c) Enter distance from MAP in feet, i.e., 3000. Ref. Order 8200.1, Section 301, ILS-Localizer Back Course Zone 3.

(13) Offset Localizers: These facilities are evaluated in the ILS-3 Mode, except that the aircraft must be uncoupled at sufficient distance from the runway threshold to be flown manually to the runway threshold and runway end for fix update. The FIS has the capability of defining structure and alignment using this technique. **Aircraft lateral displacement at threshold and the departure end is limited to 99 ft due to software limitations.** In addition, deflection of the localizer crosspointer greater than 150 µA at the first runway update is not recommended. Operationally, the edge of the runway may be selected for the first fix update to preclude crosspointer deviation greater than 150 µA.

(14) Repeatability: During commissioning or special inspections for an angle change, use the average of no less than 2 runs, with 0.06° or less difference, to determine the actual angle. If the ILS-3 angle runs do not repeat within 0.06° on any type inspection, terminate the inspection until the cause of the non-repeatability can be determined.

(15) Best Fit Straight line (BFSL):

(a) The BAe-800 Sierra Flight Inspection System (FIS) Best Fit Straight Line (BFSL) flight inspection software is authorized for evaluating glide slope facilities per Order 8240.47.

(b) Change the following in the FIS facility database:

1 GLS Lat/ Long to ASIS database glide slope Aiming Point Lat/ Long

2 GLS Elev to ASIS data base CL EL ABM elevation

3 GLS Cross - RW Offset to "L0001"

(c) Fly three ILS-3 runs (Normal/ BFSL prompt selected as Normal).

(d) Note the Zone 2 BFSL Angle.

(e) Note the Aiming Point Elevation.

(f) Change the Facility Data Base (FDB) GS – HGT to reflect the average of the three aiming point elevations

(g) Continue ILS-3 runs until the criteria in Order 8240.47 is met.

NOTE 1

***The RDH must be determined using the formula in Order 8240.47*.**

NOTE 2

The ARDH value mentioned in Order 8240.47 cannot be determined with the Sierra.

NOTE 3

The Hawker FIS does not have the capability to announce Point B, C, or T microamp/ feet displacement in lieu of the ARDH.

(16) ILS-4 Mode: The ILS-4 mode is a basic manual mode. It can be used for any type of ILS flight inspection, although the primary purpose is for the following runs:

(a) Modulation Level and Equality.

(b) Phasing.

(c) Clearance Below Path.

(d) Glide Slope Antenna Engineering Checks.

NOTE 1

Tabular data for Fix Event results is provided. Runway updating is not provided. All crosspointer information must be manually analyzed.

NOTE 2

Pilots should mark both the 1,000 ft light bar and threshold to orient the recorded plots.

NOTE 3

Marker Beacons cannot be analyzed in an ILS-4 profile.

NOTE 4

The mileage that is displayed by the FIS is the distance from the front course threshold.

(17) Computed elevation angle: The announced ILS-4 vertical angle will be inaccurate close to the runway due to range and altitude errors.

K. FIS MANUAL ILS PROCEDURES

(1) DME Land Marking (Using Excel): The following is a step-by-step procedure using a geodetic spreadsheet obtained from Flight Inspection Technical Support Branch, AVN-210.

OBTAIN FROM the ASIS data sheet:

(a) Localizer Coordinates.

(b) DME Coordinates.

(c) ILS Back-Course Bearing.

(2) Open Windows/ Excel.

(3) Select NAD 83/ direct 83.xls file.

(4) Cursor to DIST A (nm).

(5) Enter 10.

(6) Enter LOC Lat/Long (Example - 313455.61 is thirty-one degrees, thirty-four minutes, fifty-five and sixty-one one-hundredths of a second.)

(7) Cursor to RAD A.

(8) Enter ILS BCB.

(9) LLNB Lat Long on the right side of the worksheet will be the correct landmark coordinates to use as a DME landmark on Localizer Centerline for a 10 nm ILS-1 arc and an ILS-2 level run.

(10) Compute additional DME landmarks (one at 11 nm from the localizer, and one that should occur outside the ILS-2 SBP point) from the localizer coordinates.

(11) LLNB will represent additional LM's, used for ILS-1 and ILS-2 runs, as described later.

(12) Close the file and open NAD 83/ INV 83.xls

(13) Cursor to LLNA, Lat/ Long.

(14) Enter the VTAC, TACAN, or DME facility coordinates the pilots will use to landmark.

(15) Cursor to LLNB Lat/ Long

(16) Enter the coordinates obtained in Step 9 (10 nm fix).

(17) The resulting distance will be the correct DME to mark a 10 nm ILS-1 arc, or an ILS-2 level run.

(18) Cursor to a new LLNA Lat/ Long.

(19) Enter the DME coordinates from Step 14.

(20) Cursor to LLNB Lat/ Long.

(21) Enter the next LM coordinates from Step 11.

(22) The answer will be the additional DME(s) to LM an ILS-1 or ILS-2 run.

(23) Load the DME LM coordinates (from Steps 9 and 11, respectively) into the Sierra Landmark page. The altitude required on the LM page is the aircraft's MSL altitude while over the LM (usually GSI or LCA).

(24) Advise the pilots which DME LM is armed for a particular run.

L. LOW DME/ GPS ILS-1 PROFILE

To be used when FIS Auto procedures are impractical.

NOTE

This procedure is useful in areas of no DME(s) (or when just 2 DME(s) are received, skewing the FIS positioning accuracy) and where GPS accuracy is doubtful. Normally, all the crossings will be done in the same direction, landmarking at 11 nm and gathering localizer data at 10 nm. Inspection time will increase due to the inefficiency of the flight track.

(1) The Pilot will:

(a) Select **FIS MANUAL** from the cockpit.

(b) Program an 11 nm arc, referenced to the localizer coordinates, on the pilot's FMS. A 72-leg orbit will keep the aircraft in a continuous turn, rather than a series of straight segments.

(c) Input the ILS-1 coordinates, obtained using the Excel program, in the FMS, as well as RWY Threshold.

(d) Establish a racetrack pattern, perpendicular to the localizer front course centerline, between 10 and 11 nm (as measured from the localizer).

(e) On the MFD, select LNAV #2 as the display source.

(f) On the co-pilot's FMS, select "go direct" to the 11 nm coordinates. (If the 10 nm coordinates are also entered in the FMS, the MFD will display the two points, in conjunction with RWY Threshold, as a straight line coinciding with the LOC course).

(g) On NAV page 1, cursor to the "DTK" line, and enter the LOC inbound course. This will display a course line to the 11 nm waypoint that coincides with the LOC course.

(h) While on the arc, the MFD will show the LOC on-course line and the 11 nm waypoint. If the co-pilot is using the LNAV display on the ND, "second course" can be brought up on the ND to depict the LOC raw data.

(i) When within 10° of LOC CL, use the 5 nm range on the MFD to ensure the most accurate update presentation.

(j) When passing through the LOC CL at 11 nm, the waypoint symbol should be centered on the MFD aircraft reference symbol. This is a visual cross-check to verify the FMS composite position is accurate.

(k) The computed DME distance must be cross-checked to ensure LOC CL fix update accuracy. The LNAV presentation on the MFD is nothing more than a graphic representation of the aircraft's flight path. It is only as accurate as the composite position in the FMS. **<u>The critical factor for ILS-1 course crossing is to cross the LOC CL at the computed DME</u>. If the aircraft crosses the CL at a DME distance more than 0.1 nm from the desired DME distance, the run should be repeated. A 0.1 nm DME fix error equates to a 0.06° difference in measured course width (based on a 4.00° course width and 0.15 nm DME error)**.

CAUTION

A MAXIMUM OF 0.12° COURSE WIDTH ERROR CAN BE INDUCED BETWEEN RUNS THAT VARIED FROM + 0.15 TO - 0.15 nm DME ERROR.

(l) If the waypoint crossing looks good, execute a landmark update for the FIS and a "hold-update" for the FMS as the LOC raw data crosspointer passes the "On-Course" position. **A position difference of 0.1 nm or less on the FMS is satisfactory in the ILS-1 mode.**

(m) Course width measurements should be flown at 180 knots to allow for a small turning radius.

(2) <u>The AET will:</u>

(a) Set up the FIS for an ILS-1 CW or CCW with the 11 nm LM armed.

(b) Ensure the pilot executes the landmark at the DME corresponding to 11 nm on localizer CL, **<u>prior to starting the FIS</u>**. Execute another LM prior to starting the FIS if the position error exceeds **1,400** ft after the first LM. **Reject and repeat any landmark executed at a displayed DME error greater than ± 0.2 nm (± 0.1 nm for commissioning or engineering assistance) of the desired DME reading at the landmark.**

(c) Ensure the pilot continues the racetrack, and starts the FIS in time to evaluate a 10 nm ILS-1 run in the direction selected.

(d) Stop the FIS when sufficient data has been collected.

(e) Select **"NO"** at the smoothing prompt. A "YES" selection will cause erroneous facility results and induce FIS positioning errors.

NOTE 1

Post-Profile plots are not necessary unless desired to correctly display the FIS Bearing and Distance marks.

NOTE 2

The pilot should monitor the IRU drift rate by executing a "Hold Update" at each landmark.

M. LOW DME/ GPS ILS-1 PROFILE (Using FIS AUTO and SMOOTHING) (Preferred Low DME Flight Inspection Mode)

(1) This is the recommended Low DME ILS-1 procedure, since the aircraft can position for normal 10 nm ILS-1 CW/ CCW arcs. Landmarking and smoothing the profile will apply the landmark accuracy, as well as any received DME(s), to the entire run.

CAUTION

FIS position accuracy may be corrupted during the following:

(a) If only 2 DME(s) are received.

(b) If ILS DME(s) that are adjusted to indicate 0 DME at runway threshold are received.

(c) When poor geometry between available DME(s) is present.

NOTE 1

Remove all but one of the DME facilities from the data base in these situations . This action will force the FIS to place maximum emphasis on the DME landmark.

NOTE 2

If GPS positioning is inaccurate, pull the GNSS circuit breaker.

(2) The pilot will set up the FMS and MFD for a 10 nm and LOC CL crossing.

(a) Select **FIS AUTO** from the cockpit.

(b) Establish the aircraft for an ILS-1 10 nm from the localizer.

(c) Set the FIS for an ILS-1 profile with the 10 nm LM armed.

(d) Start the FIS in time to evaluate the localizer CW, symmetry, and clearances.

(e) **While the FIS is running,** execute the LM at the DME corresponding to 10 nm on localizer CL. **Reject and repeat any landmark executed at a displayed DME greater than ± 0.2 nm (± 0.1 nm for commissioning or engineering assistance) from the desired reading at the landmark**.

(f) Stop the run when sufficient localizer data is obtained.

(g) Select **"YES"** at the smoothing prompt. In this case, (FIS AUTO) smoothing will correctly update the run and ensure accurate results.

NOTE

Minor delays in obtaining ILS-1 results (5 - 10 seconds) are necessitated, using the smoothing option.

N. LOW DME ILS-2 PROFILE

(1) Select **<u>FIS MANUAL</u>** from the cockpit.

(2) Establish the aircraft inbound, on localizer centerline, beyond the SBP point.

(3) Select ILS-2 profile from the Profile menu.

(4) Arm a LM projected to occur outside the SBP. A calculated DME position along the localizer centerline is a desirable landmark.

(5) Execute the LM at the DME corresponding to the desired landmark, while on localizer CL, **<u>prior</u>** to starting the FIS. **Reject and repeat any landmark executed at a displayed DME greater than ± 0.2 nm from the desired DME reading at the landmark.**

NOTE

If possible, execute two LMs during the first ILS-2. Thereafter, a single LM will suffice, once the ILS-2 holding pattern is established. Use the two LM method anytime the pattern is interrupted or if LM positioning error exceeds 1,400 ft.

(6) Start the FIS prior to the SBP point.

(7) Stop the run after the required "CAP". Select **"<u>NO</u>"** at the smoothing prompt.

NOTE 1

The pilot should monitor the IRU drift by executing a "Hold Update" at selected landmarks.

NOTE 2

In areas of no DME, any prominent geographical fix of known coordinates, located along the aircraft's track, can be used for an ILS-2 landmark update. The most logical choice would be a marker beacon or RWY Threshold.

O. ILS-3 PROFILES

(1) ILS-3 profiles **<u>must be flown in FIS- AUTO mode.</u>** Reset FIS to the "main menu" screen if problems are encountered.

CAUTION

IN REMOTE AREAS (i.e., ISLANDS) WHERE A TOTAL OF TWO DME'S ARE RECEIVED FOR MULTILATERATION AND GPS POSITIONING IS INACCURATE, IT MAY BECOME NECESSARY TO DELETE ONE OF THE DME FACILITIES FROM THE FDB. IN THESE CONDITIONS, MANUAL DELETION OF ONE DME FORCES THE FIS TO COMPUTE ILS RESULTS, BASED SOLELY ON RUNWAY UPDATES, ELIMINATING FIS ERROR BASED ON BAD DME GEOMETRY.

NOTE

If GPS positioning is inaccurate, pull the GNSSU circuit breaker.

(2) In low DME/ satellite areas, it may become necessary to landmark update prior to obtaining the RWY updates. Use either a DME landmark obtained from the Excel program, or a known coordinate along the ILS-3 track. **Landmark at a distance sufficient to update the FIS position beyond 5 nm from threshold. FMS updates can also be accomplished at the threshold and/or departure runway end.**

(3) Ensure the weather radar is in the off/ standby position prior to crossing the FAF.

P. VOR /TACAN /VORTAC FIS AUTO PROCEDURES

(1) Alignment and bend measurements will not be reported less than 10 nm from the station (with no GPS capability), or less than 5 nm (with adequate GPS/ DME positioning).

(2) Structure data from the 5-mile segment closest to the facility will be invalidated when overflying the facility under test with the FIS operating. If the FIS can be stopped, or "analysis off" instituted prior to the overflight, automated structure results can be reported. **Otherwise, manually analyze the structure.**

(3) Documentation: Annotate gear transition on the printer/ plotter when using TACAN #1 lower antenna (due to a temporary AGC deflection).

(4) AFIS Reference Radial (ARR): An ARR will be established as a reference for inspecting course alignment, monitors, and modulation. The ARR alignment should be the mean azimuth error for a 5 nm segment between 10 to 25 nm (e.g., 10-15, 15-20, 20-25).

(a) Select a radial with good structure quality that compares well with the alignment orbit.

(b) Report the filtered bearing error (mean alignment) and VOR modulation for the 5-mile segment between 10 and 25 nm from the tabular results.

(c) Document the established bearing alignment, segment, direction, and MSL altitude of the ARR on an AMIS product.

(d) On subsequent inspections, **evaluate the same segment, in the same direction, at the established altitude.**

(e) If the ARR is established over a 10 nm segment, manually average the long-term filtered bearing error from the two 5-mile segments involved.

(5) Monitors: After establishment of an ARR, monitors can be checked either airborne or on the ground.

(a) Ground Procedure: Using the crosspointer trace, fix event the Normal and each alarm shift for documentation in post-profile tabular results.

(b) Airborne Procedure: Use the filtered bearing error data to evaluate the course shifts.

(c) Alternate Airborne Procedure 1: At the start of the ARR segment, direct maintenance to alarm the facility in a positive then negative direction, returning to Normal, all in the 5-mile segment. This entails maintenance **quickly** shifting the alignment to the alarm points, notifying the flight check aircraft at each alarm, then returning to normal. Manually analyze the Bearing Error trace instantaneous shift from Normal to the alarm points

(d) Alternate Airborne Procedure 2:

1 Select a prominent ground checkpoint that can be repeatably identified.

2 Measure the raw received bearing while directly over the checkpoint while the equipment is in Normal.

3 Repeat this procedure for each alarm condition, ensuring that the received bearing while in alarm condition is within 1° of the received bearing while the equipment was in Normal.

4 Restore the facility to Normal and ensure that the received bearing is within the established limits.

(6) En Route Radials: Inspect the radial(s), either inbound or outbound, throughout its intended use, for mean alignment, structure, and other required parameters.

(7) Terminal Radials:

(a) Mixing radial and orbital flight during a profile will result in confusing tabular data. To eliminate this, approaches will be subdivided into a series of arcs and radial profiles. Fly holding patterns in radial mode and arcs in orbit mode.

(b) Nulls: On the Hawker FIS, nulls may be flown inbound or outbound, preferably in a figure-eight maneuver. If there is insufficient time to set up the FIS profile, the AET may abort the profile between nulls, eliminating time required for post-profile plotting. The AET then must manually analyze the entire null run.

(8) Alignment Orbits:

(a) The radius of an orbit for alignment evaluation is normally 10 nm and beyond, and the tapeline altitude is selected to provide an orbit 4 - 6° above the facility. **FIS orbit distances less than 10 nm are not recommended.**

(b) Smoothing and post-profile plots are not normally required.

(9) Coverage Orbits:

(a) Post-profile plots and tabular results are not mandatory.

(b) Manually analyze structure in real-time. Alignment can also be monitored in real-time, providing FIS positioning is accurate, via the VOR or TACAN Bearing Error trace.

(10) Intersection Mode:

(a) **VOR.** While in FIS Auto mode, the FIS can evaluate 2 VOR's for structure, signal strength, modulations, alignment error, and flag lock-on. The profile is set up for the primary facility, then the IDENT of the secondary facility, when provided by the operator, auto-tunes the secondary VOR receiver. The final requirement is for the secondary OBS setting, again a "typed-in" prompt.

CAUTION

POST-PROFILE TABULAR DATA IS PROVIDED FOR THE PRIMARY FACILITY ONLY.

(b) **TACAN.** As with the VOR, primary and secondary TACAN(s) can be evaluated using the same profile setup. FIS Manual must be selected to auto-tune the secondary TACAN, **disabling** multilateration. The preferred technique is to switch from FIS Auto to FIS Manual immediately prior to the intersection, thus preventing FIS platform drift.

CAUTION

RANGE ERROR AND ALL POST-PROFILE TABULAR DATA ARE PROVIDED FOR THE PRIMARY FACILITY ONLY.

(11) **TACAN Antenna Positions.** Select the antenna that produces the strongest AGC. On arcs and orbits, the upper antenna normally provides higher AGC readings. On approaches, the lower antenna normally produces higher AGC indications, unless antenna screening is a problem. The two FIS TACANs are shared with the cockpit. The pilot will set TAC # 1 to the TACAN channel being flight inspected. It must remain tuned throughout the inspection in order to evaluate the facility. TAC # 2 is FIS controlled during normal ops (FIS AUTO). This configuration allows the FIS to obtain the automatic DME updates, when used, for positioning. It will be unusable for aircraft navigation by the co-pilot during these times. During Hybrid GPS positioning (normal operation), the #2 TACAN upper antenna is manually selected to disable DME multilateration. During FIS Manual operations, TACAN #2 is usable for navigation when the lower antenna is selected.

(12) **Standby equipment**. If transmitters are changed while in a profile mode, the tabular data will be invalid for the sector that the transmitter was changed. Annotate the plot when transmitter changes occur, to prevent reporting the invalid sector.

Q. VOR /TACAN /VORTAC LOW DME PROCEDURES

(1) <u>Alignment Orbits:</u>

(a) Select **FIS MANUAL** from the cockpit and pull the GNSSU CB.

(b) Set up a CW or CCW orbit profile on the FIS.

(c) Arm the AFIS-provided landmark.

(d) While in pre-profile mode, **<u>and prior to starting the FIS,</u>** execute the landmark, outbound over the station at an altitude of 500 ft AGL, or lower, to ensure landmark accuracy.

NOTE

Execute two landmarks if the FIS position error exceeds 2,000 ft after the first landmark.

(2) Start the FIS **<u>only</u>** upon turning onto the orbit at 10 nm. (**Starting the FIS while still in radial flight will invalidate the post-profile results**).

(3) Terminate the orbit and stop the FIS NLT 120° after start.

(4) Select **"<u>NO</u>"** at the smoothing option. A "YES" selection will incapacitate the post-profile results and provide erroneous platform error.

(5) Fly inbound to the station while printing post-profile results.

(6) Repeat Steps 1 through 8 until the orbit is completed, in 3 or more segments.

NOTE

Continue executing 2 landmarks anytime the FIS position error exceeds 2,000 ft at the time of the landmark.

(7) Radically probe outbound and/or repeat shorter arc segments in any area of questionable facility results.

NOTE 1

If the Bearing or Range Error drift is excessive, as can be caused by an accumulative IRU sensor error after several hours of flight, land and re-align the FMS. This action will reset the velocity sensors and minimize the drift in most cases.

NOTE 2

The pilot should monitor the IRU drift rate by executing a "Hold Update" at each landmark.

(8) <u>Low DME Radials In Lieu of an Alignment Orbit:</u>

(a) Select **FIS MANUAL** from the cockpit.

(b) Arm the AFIS-provided LM (always the facility under test) prior to over flying the facility.

(c) Start the first radial outbound, execute landmark over the station.

NOTE

Execute two landmarks if the FIS position error exceeds 2,000 ft after the first landmark.

(d) Start the FIS immediately after verifying a satisfactory landmark.

(e) Terminate the profile and stop the FIS at 15 nm, evaluating alignment 10-15 nm.

(f) Select **"<u>NO</u>"** at the smoothing prompt.

(g) Select the next inbound radial not more than 90° offset from the last radial.

(h) Start the profile and the FIS at 15 nm (evaluate alignment 15-10 nm) and fly to the station, landmarking over the station.

(i) Stop the FIS **<u>after</u>** the landmark. (**Do not smooth the run**).

(j) Quickly set the FIS for the next outbound radial while the aircraft prepares to overfly the station.

(k) Repeat the procedure in Steps 1 -6 for the next outbound radial.

NOTE 1

Always landmark the facility on each inbound radial and again on the outbound radial; execute two landmarks anytime the FIS position error exceeds 2,000 ft.

NOTE 2

The pilot should monitor the IRU drift rate by executing a "Hold Update" at each landmark.

(l) Refly any radial outbound (after again landmarking the station) to verify questionable facility results.

(m) Continue the procedure until the four radials are completed.

R. PAR, VASI, AND ASR MODES

(1) The non-ILS runway updating profiles are PAR, VASI, and ASR approach profiles. Results depend on crew inputs, rather than a received signal from a NAVAID.

(2) Results are calculated slightly differently for each profile. PAR results include average angles and BFSL data for elevation and azimuth. VASI results are average and BFSL data for elevation angles only, and ASR results are distance from centerline when the event button is pressed.

(3) The co-pilot will make runway event marks at the approach and departure thresholds. The same procedures apply as with the ILS-3 profiles.

(4) PAR Inspections:

(a) Input information for the data base as follows:

SIERRA	**ASIS**
GP INT TO THR OFFSET	GPI-TH DISTANCE
GP INT LAT	GPI LAT
GP INT LON	GPI LONG
GP INTERCEPT ELEV	GPI ELEV (MSL)

(b) Elevation: Mean elevation angle is measured from the GPI coordinates in the database.

(c) Azimuth:

(1) PAR azimuth accuracy can be inspected visually. The tabular results can assist the pilot in determining alignment accuracy.

(2) The mean azimuth error is the average of the individual on-course azimuth errors at each event mark. The reference point is the GPI coordinates.

(d) Orbit mode: This mode is used to measure the lateral coverage of the PAR signal. It does not use the runway updating feature.

(5) VASI INSPECTIONS

(a) Approach profile:

(1) Mean elevation angle is measured from Runway Reference Point (RRP) coordinates in the database. The mean angle will be correct if these coordinates are correct. If the individual angles in the table change as the aircraft approaches the runway, the RRP data is suspect.

(2) The pilot will fly the VASI on-path, while the co-pilot makes marks at equal intervals. Since the VASI is .5° wide, the pilot will attempt to fly down the center of the path or vary the approach between the red/ red and white/ white extremes, so that the true average angle is computed.

(b) Radial profile: The pilot will fly a level run, and the co-pilot will event mark the light color transitions (red/ red to red/ white and red/ white to white/ white). Runway marks are not required. This mode will not be as accurate as the approach mode.

(c) Orbit profile: The orbit mode is used for lateral coverage. The pilot will fly the aircraft perpendicular to the runway and event mark when the VASI lights first appear and then disappear.

(6) PAPI INSPECTIONS

(a) PAPI procedures are slightly different than VASI due to the two extra light units and the common location of the units.

(b) PAPI will be flown, using the VASI approach profile mode, to measure the red/ white transition angle for each of the four adjacent light units. The pilot may fly a preliminary level run to evaluate the overall symmetry of the PAPI system, while the co-pilot marks the transition from red to white for each light unit. The pilot will then descend to the glide path and make a normal approach, while the co-pilot makes runway threshold and departure end ILS-3 type event marks. The AET will obtain the transition angle for each of the four units from the tabular results table. The on-path angle will be the average of: the second and third angle (for a 4-box system), or the first and second angle (for a 2-box system).

(c) Reported PAPI angles shall be determined by flying an approach down the red/ white transition point for each box, making multiple event marks of the transition point. Use the VASI approach mode. Each approach will terminate in ILS-3 type updates at threshold and departure ends of the runway. This requires a maximum of four runs (for the 4-box system), although runs on Boxes 2 and 3 (4-box PAPI) are the minimum required angle runs.

(7) ASR

(a) General: A separate data base entry is required for the orbit and approach modes to the same location. The AET will ensure that the database is completely filled. (A runway heading entry is required for the orbit mode, even though the data will not be used in the computation.)

(b) Approach Profiles: The approach mode provides data on the displacement of the final approach course from the extended centerline in feet. While the tolerance for alignment is applied to the event mark at the missed approach point, the on-course event data from the entire approach can be given to ATC to show how well the approach coincided with the runway centerline.

(c) <u>Orbit profiles:</u> The orbit mode is used for measuring ASR orientation through manual azimuth and range input. The FIS then calculates the error and displays it in terms of azimuth error, total distance error, and percent of error (total distance error divided by the range to the facility). This mode can be used in lieu of ground checkpoints. The AET should first ensure that the calculated position of the aircraft is accurate before using the results. Runway event marks are not used for this profile.

S. HAWKER MLS OPERATIONS

(1) GENERAL

(a) The Hawker MLS capability consists of a portable package which must be installed prior to each inspection. It is a RTT dependent manually operated flight inspection system.

(b) The package consists of dual MLS receivers, data monitor (capable of displaying all basic and auxiliary data words, and real time azimuth/ elevation position), analog printer capable of printing all data displayed on the monitor, RTT receiver and calibration unit, oscilloscope, RMS-33 printer/ plotter, and self-contained VHF radio.

(c) Either MLS receiver can be selected to provide guidance signals and flags to the cockpit Standby Attitude Indicator via an MLS-1/ MLS-2 select switch on the AET's console. During normal MLS flight inspection, MLS-1 is selected with the following results:

(1) Connects the forward and aft MLS antennas to the Bendix ML-211B receiver.

(2) Provides the Bendix receiver output signals to the cockpit, RMS33 recorder (for flight inspection analysis), data monitor, and the RTT Control box.

(d) Selection of "MLS-2" does the following:

(1) Disconnects the Bendix flight inspection receiver from the cockpit and flight inspection panel.

(2) Connects the "USAF unique" CMLSA receiver to the cockpit Standby Attitude Indicator.

NOTE 1

***The CMLSA receiver, using internal software, allows an aircraft to fly an MLS approach to RWY centerline when the MLS Azimuth station is offset to the side of the runway*.**

NOTE 2

The CMLSA is not approved for any other flight inspection use. Its only function is to allow certification of a "computed" MMLS approach.

CAUTION

THE AET CAN CAUSE A CENTERED COCKPIT CDI FOR ANY AZIMUTH COURSE ± 40° OF CENTERLINE, AND ANY ANGLE UP TO 15°

NOTE 3

The Hawker's autopilot cannot couple to the MLS signal.

(e) A separate headset, configured to plug-in to the MLS panel, is provided. MLS-1 IDENT can be monitored by depressing the lower NAV 2 audio select on the radio. Set the selector to Position 3 and adjust volume using the Bendix receiver. Ground maintenance and theodolite can be monitored on the lower COM 1 audio select.

NOTE

***While wearing this headset, cabin intercom communications are not possible. A separate headset must be used to communicate with crewmember*.**

(f) ID plot on RMS 33 printer is controlled by the RTT control unit selector knob.

T. PREFLIGHT CHECKS

(1) Select MLS-1.

(2) Perform the manual self-test. When the mode selector switch on the control display is set to “TST”, a self-test of the Bendix ML-211B receiver and control display is initiated. The test will last 12 seconds, as follows:

(a) 4 seconds – All segments of the LCD will appear. Azimuth and elevation deviation indicators center and the azimuth and elevation flag appear.

(b) 2 seconds – The LCD will blank, the deviation indicators will move up and left 40% of full scale, the flags will be removed from view, and “MTST” is sent on the audio.

(c) 2 seconds – Pass is displayed (provided unit passes) in the channel window of the display unit and remains until the mode switch is moved out of the test position. Flags remain out of view, left deviation continues, LU is displayed in the GS window of the display unit.

(d) 4 seconds – The deviation indicators change to the right and down for 40% of full scale. RD replaces LU in the GS window of the display. Flags remain out of view.

(e) At the completion of the 12 seconds, MTST audio stops, deviation indicators center, AZ and GS flags move into view. "PASS" continues to be displayed in the channel window.

(3) Select MLS-2.

(4) On the CMLSA control head, set the "Function" control to "TST".

(a) Azimuth and glide path flags disappear.

(b) GP deviation bar on the CDI moves up to half-scale deviation.

(c) The AZ deviation bar on the CDI moves left to half-scale deflection.

(d) After 3 seconds, the AZ and GP deviation bars revert from fly up/ left to down/ right and remain for 6 seconds.

(e) After 6 seconds, both GP and AZ deviation bars return to zero deflection and the GP and AZ flags appear.

(f) The CDU display shows "END" for a successful check. If a failure occurs, the display will show "FAIL".

(5) DME associated with the MLS is displayed on an indicator located directly in front of the AET. DME range accuracy may be evaluated by developing a separate DME database for the AFIS, or by verifying the indicated DME to a known distance. Once range accuracy is verified, the AET can monitor the DME IDENT by plugging a headset into the Intercom panel at the AFIS position and using a long communications cord to reach the MLS panel, forward of the AFIS position. DME unlocks can be monitored via the indicator on the MLS panel.

(6) The MLS-1 Data Monitor displays the aircraft's current offset from the Designed Procedural Azimuth (just as on an ILS-1 run, a **negative** number indicates **right** of centerline, and a **positive** number represents **left** of centerline. Changing the azimuth or elevation on the MLS receiver control head centers up the pilot's indicator when the aircraft's position matches that setting; however, the data monitor will **always** reference the aircraft's position from the designed procedural azimuth. The elevation display indicates the angle the aircraft is flying relative to the elevation antenna. Both azimuth and elevation data are provided only when in the Proportional guidance area of the MLS.

(7) MLS-1 azimuth crosspointer, RTT, and differential traces are normally calibrated for a **0.05°** deflection/ **light line** (0.1 inch) of movement on the RMS-33. This value is attained by calibrating the RTT for a 1.0° per 2-inch deflection on the plotter using the RTT control box and a specially modified theodolite. Elevation crosspointer and its associated RTT and differential traces are normally calibrated for a 0.30° per 1.6 inches or **0.01875° per light line (0.10 inch).**

NOTE

Calibration of 0.30° per 2 inches or 0.015° per light line (0.10 inch) is also acceptable.

(8) A **left** (as seen by the aircraft) **azimuth** misalignment is corrected by a **negative** bias adjustment on the MMLS. A **low** elevation angle is corrected by a **positive** MMLS bias adjustment.

U. **ARCS.** Azimuth and elevation 10 nm and 20 nm arcs are accomplished without RTT. Depressing the "75/ 150" selector on the MLS-1 RTT control box to the "150" position doubles the value per light line of the crosspointer traces and allows approximately 2° of azimuth to be displayed on the RMS 33. By manually selecting azimuth courses that "lead" the aircraft position, the full 80° of azimuth arc can be displayed on the plotter in a saw-toothed format (similar to a Rho-Theta Orbit).

NOTE 1

The aircraft should be flown as slowly as possible to allow the AET time to set up the ever-changing azimuth courses.

NOTE 2

The azimuth crosspointer trace is active only when an azimuth course within proportional guidance is selected.

NOTE 3

Azimuth courses offset from runway centerline are determined by referencing the magnetic azimuth of centerline to the degree of positive or negative offset, as determined from the data monitor display, i.e., CL course is 090, data monitor indicates + 15, select 105 in the azimuth select to obtain azimuth crosspointer on the RMS-33.

CAUTION

PILOTS MUST DISREGARD COCKPIT MLS AZIMUTH INDICATIONS (DUE TO THE AET "SLEWING" THE AZIMUTH COURSE SETTING ON THE MLS RECEIVER.

V. **LEVEL RUNS** are also flown without RTT guidance. The AET should advise the pilot as to the azimuth selected (current requirements are for one on the designed procedural azimuth and 10° either side). Elevation angles are selected by the AET to maintain elevation crosspointer on the plotter, again in a saw-tooth manner. Depressing the 75/ 150 selector on the MLS-RTT control box to the 150 position doubles the value per light line.

CAUTION

PILOTS MUST DISREGARD COCKPIT MLS ELEVATION INDICATIONS (DUE TO THE AET "SLEWING" THE ELEVATION ANGLES ON THE MLS RECEIVER).

W. MMLS AZIMUTH MONITORS. Azimuth monitors, when checked on the ground, can be accomplished by selecting the received azimuth on the MLS receiver, then monitoring the alarm shift. Azimuth crosspointer calibration value remains **0.05° per light line.** Apply the airborne PFE tolerances throughout the entire approach. Any out-of-tolerance PFE indications must be corrected by "tightening" the monitor shift or taking action to improve the approach PFE in normal settings.

X. MMLS ELEVATION MONITORS

(1) Fly an elevation RTT run in both the low angle and high angle alarm

(2) Apply the airborne PFE tolerances throughout the entire approach. Any out-of-tolerance PFE indications must be corrected by "tightening" the monitor shift or taking action to improve the approach PFE in normal settings.

Y. MMLS CMLSA OFFSET AZIMUTH COMPUTED APPROACH CERTIFICATION

(1) Select MLS-2

(2) On the CMLSA control head:

- Select "ENT" on the left control
- Enter channel, azimuth, and elevation angle.
- Select "NAV" on the left control.
- Select "AZ" on the center control.
- Select "Comp-Auto" on the right control.

NOTE

MLS-1 functions are disabled.

CAUTION

COCKPIT INSTRUMENTS NOW CENTER WHEN ON EXTENDED RWY CENTERLINE; NOT ON THE DESIGNED APPROACH AZIMUTH.

Z. INITIAL RMS 33 SETUP. The initial settings on the RMS GR33 record are as follows. Refer to the RMS User's Manual for further information.

LABEL	CHANNEL NUMBER	ON/ OFF	SENSITIVITY		POSITION
AZ FL	000	ON	1.200	VI	200
EL FL	001	ON	1.200	VI	1100
EL CP	002	ON	37.5	MI	900
AZ CP	003	ON	37.5	MI	300
RTT	004	ON	37.5	MI	500
RT FL	005	ON	.300	VI	90
DIFF	006	ON	37.5	MI	600
DMFL	015	ON	1.000		1000
AZFO	025	ON	1.000	VI	200
ELFO	026	ON	1.000	VI	1100
RTFO	027	ON	1.000	VI	90
AZO	028	ON	1.000	VI	300
RTO	029	ON	1.000	VI	500
DFO	030	ON	1.000	VI	600
ELCO	031	ON	1.000	VI	900

The label for any channel turned OFF is immaterial.
Grid style **9** is selected.
Chart speed of 6 inches/ MIN is selected.
Filter – Select LOWP N1 for Channels 0 thru 6.
The following routines are to assist in the adjustment of some of the above parameters.

To print **DEFAULTS:**

ON
HOLD LIGHT OFF
ROTARY FUNCTIONS
SET
Y/O
Parameter Table
Y/ O
SET light on
Y/ O (will start printing)

The first 4 steps are usually common to all adjustments.

1) ON
2) HOLD light off
3) Select menu with rotary knob
4) Y/ O to sub menu

GRIDS	POSITION
(4)	(4)
SET set light on	SET light off
ROTARY (0-21)	ROTARY to select position (100 = 1 inch)
SET set light off	SET light on

SENSITIVITY
(4)
ROTARY (to proper channel)
SET
Y/ 0 for channel ON/ OFF (Label + value is ON)
ROTARY to change sensitivity (FINE for < 1.0)

LABEL
(4)
ROTARY to select channel
SET light on
N/ I selects position to change
ROTARY selects character for that position
SET light off
CLT
Y/ O

More detailed instructions are in the RMS GR33 User Manual.

AA. AZIMUTH MLS CHECKLIST (Airborne Setup)

(1) Select MLS-1.

(2) RTT CONTROL UNIT:

ON
DISC OFF
CAL OFF
SETUP ON
75 CAL
AZ

(3) RTT THEO AZ “0”

DVM-RTT	DVM-DIFF
1. ADJUST RTT ZERO POT	1. ADJUST DIFF ZERO POT
2. DVM ± .001 VOLTS	2. DVM ± .001 VOLTS
3. RTT 5 IN BASELINE (RMS)	3. DIFF 6 IN BASELINE (RMS)

(4) RTT THEO AZ +1.0°

DVM-RTT	DVM-DIFF
1. ADJUST RTT GAIN POT	1. ADJUST DIFF GAIN POT
2. DVM + .075 VOLTS	2. DVM - .075 VOLTS
3. RTT 2 IN LEFT (RMS)	3. DIFF 2 IN RIGHT (RMS)

(5) RTT THEO –1.0°

DVM-RTT	DVM-DIFF
1. DVM -.075 VOLTS	1. DVM + .075 VOLTS
2. RTT 2 IN RIGHT (RMS)	2. RTT 2 IN LEFT (RMS)

(6) RTT THEO AZ “0”

(7) RTT SETUP OFF

(8) **DIFF TRACE DEFLECTS LEFT FOR RIGHT MLS MISALIGNMENT**

(9) **.05°/ LL @ 37.5 RMS SENS**

BB. MLS ELEVATION CHECKLIST (Airborne Setup)

(1) Select MLS-1.

(2) RTT CONTROL UNIT

ON
DISC OFF
CAL OFF
SETUP ON
75 CAL
EL

(3) RTT THEO ELEVATION “0” DDM

DVM-RTT	DVM-DIFF
1. ADJUST RTT ZERO POT	1. ADJUST DIFF ZERO POT
2. DVM ± .001 VOLTS	2. DVM ± .001 VOLTS
3. RTT 5 IN BASELINE (RMS)	3. DIFF 6 IN BASELINE (RMS)

(4) RTT THEO EL +0.30° (FROM REFERENCE ANGLE)

DVM-RTT	DVM-DIFF
1. ADJUST RTT GAIN POT	1. ADJUST DIFF GAIN POT
2. DVM + .060 VOLTS	2. DVM - .060 VOLTS
3. RTT 1.6 IN LEFT (RMS)	3. DIFF 1.6 IN RIGHT (RMS)

(5) RTT THEO EL –0.30° (FROM REFERENCE ANGLE)

DVM-RTT	DVM-DIFF
1. DVM -.060 VOLTS	1. DVM + .060 VOLTS
2. RTT 1.6 IN RIGHT (RMS)	2. DIFF 1.6 IN LEFT (RMS)

(6) RTT THEO EL “0” DDM

(7) RTT SETUP OFF

(8) <u>**DIFF TRACE DEFLECTS RIGHT FOR HIGH MLS ANGLE**</u>

(9) **.01875°/ LL @ 37.5 RMS SENS (for a calibration of .3° per 1.6 in)**
0.015°/ LL @ 37.5 RMS SENS (for a calibration of .3° per 2 in)

CC. Use the following manual procedures to analyze azimuth and elevation, alignment, **PFE, PFN,** and **CMN.**

(1) **Approach Azimuth –** Evaluate the azimuth alignment error (MCE) by determining the arithmetic mean of all samples obtained **1 nautical mile** segment just prior to TH (1 nm from the missed approach point if the azimuth is offset or collocated). If the course is restricted within this segment due to excessive PFE, PFN, or CMN, determine the alignment in the 1 nm segment preceding the point at which the restriction occurs. Conduct azimuth RTT tracking to the maximum visual range to provide a reference for additional structure evaluation beyond 4 nm.

(2) **Elevation –** Evaluate the elevation path for alignment error (MCE) by determining the arithmetic mean of all samples obtained in the segment from **Point “A” to Point “B”.** If the path is restricted inside Point “A”, evaluate the alignment segment from Point “A” to the point at which the restriction occurs.

(3) **Definitions:**

(a) **PFE –** That portion of the guidance signal error that could cause aircraft displacement from the **desired (commissioned)** azimuth course or elevation angle.

(b) **PFN –** That portion of the guidance signal error that could cause aircraft displacement from the **Mean** azimuth course or elevation angle.

(c) **CMN –** That portion of the guidance signal error which could cause aircraft **control surface and column motion** while in coupled flight, but would not cause aircraft displacement from the desired azimuth or elevation.

DD. OTHER FACILITIES

(1) FMK. Used to evaluate a maker beacon when it is not used in conjunction with an ILS.

(2) UHF-MB. Used to evaluate UHF NDB(s), such as those used by the Navy and Marine Corps.

(3) Comm. Used to evaluate UHF and VHF radio coverage in both radial and orbital mode. The pilot will fly the aircraft relative to the antenna being evaluated by using the FMS.

(4) NDB. Used to evaluate beacons in both orbital and radial modes. The AET may record the flight and advise the pilot when needle oscillation exceeds the tolerance. The Flight Inspection Pilot will confirm all out-of-tolerance oscillations by visual observation of the needle:

(5) VOT. Used to evaluate VOR Test facilities.

(6) DF. Can be used in either radial or orbit mode as follows:

(a) Transmit via radio to the DF facility.

(b) Immediately after transmitting, press the "FIX" key on the AET's keyboard.

(c) At the FIS prompt, type in the DF operator-provided bearing.

(d) Press the "ENTER" key on the AET's keyboard to remove the prompt from the VDU and automatically set-up for the next DF bearing.

NOTE

DF Bearing Error is provided on the VDU and in table format, listing each fix, in post-profile tabular data.

EE. ALTERNATE CAPABILITY UNIT

(1) General. The Alternate Capability Unit (ACU) is normally used for "military unique" manual TACAN flight inspection. In this mode, the FIS computer is bypassed. All signals go directly to the printer/ plotter. Turning the printer/ plotter off, and then on, activates the ACU mode. The position estimation software is not used. Alignment accuracy is dependent on using an up-to-date map, correctly mounted on an azimuth plotting board and/or the theodolite.

(2) **The "theo" tone capability of the (ACU) is to be used only in conjunction with the TACAN Crosspointer Deviation**, **also from the ACU.** The ACU traces are "real-time"; therefore, the theo trace from this unit is incompatible with the delayed TACAN traces from the FIS. The Group 1 tones are in correct time sequence with the FIS TACAN Crosspointer.

(3) All signals provided to the ACU are uncorrected. Printer-plotter channel baselines and sensitivities are calibrated by avionics maintenance personnel to be the same as for FIS Auto.

(4) ACU Printer / Plotter Signal Summary:

			Signal Range			**Plot Range**			
Label	**Signal Name**	**Units**	**Ref**	**LO**	**HI**	**B/L**	**LO**	**HI**	**Scale**
T1BD	Bearing Deviation	μA	0.0	0.0	150.0	3.0	1.0	5.0	75.0
T1SS	Signal Strength	dbm	-90	-90	-40	1.0	1.0	3.5	20.0
T1ID	FAC ID	-	-	none	tone	0.0	0.0	1.0	-
T1RM	Range Marks	-	-	-	-	12.0	12.0	11.5	-
T1FL	Flag	-	-	flag	valid	12.0	12.0	*	-
THEO	Theodolite	-	-	none	tone	0.0	0.0	12.0	-
T2BD	Bearing Deviation	μA	0.0	0.0	150.0	8.0	6.0	10.0	75.0
T2SS	Signal Strength	dbm	-90	-90	-40	8.0	8.0	10.5	20.0
T2ID	FAC ID	-	-	none	tone	0.0	0.0	1.0	-
T2RM	Range Marks	-	-	-	-	12.0	12.0	11.5	-
T2FL	Flag	-	-	flag	valid	12.0	12.0	*	-

*Valid Signal Components: 11.9 inches for bearing only
11.7 inches for range only
11.6 inches for bearing and range

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CHAPTER II AIRCRAFT OPERATIONS

8A. BAe-800 AFIS UTILITY FUNCTIONS

A. **FIS DATABASE.** This section discusses various database formats and procedures unique to the Sierra AFIS, and how they should be used to conduct flight inspection of various facilities.

(1) Databases for TACAN, DME, VOR, VOT, DF, COM, UHF, HB and FMK:

(a) Facility Type

(b) Facility ID

(c) Restriction Flag

(d) Facility Frequency

(e) Facility Elevation

(f) Magnetic Variation

(g) Latitude

(h) Longitude

(2) Instructions for Completion of Rho-Theta Type Data Base Forms:

(a) Enter Type Facility

(b) Enter Facility ID

(c) Enter “Y” if Restricted, or “N” if Unrestricted

(d) Enter Facility Frequency (Paired VOR Frequency for TACAN(s))

(e) Enter Facility Elevation

(f) Enter Magnetic Variation as + for East; - for West

(g) Enter Latitude of Antenna.

(h) Enter Longitude of Antenna.

(3) ILS Data Base:

(a) Facility ID

(b) Airport ID

(c) Runway Number

(d) Restriction Flag

(e) Facility Frequency

(f) Localizer Back Course Bearing

(g) Localizer Front Course Bearing

(h) Glideslope Elevation

(i) Localizer Elevation

(j) Facility Category

(k) Magnetic Variation

(l) Restriction Start

(m) Glideslope Cross Runway Offset

(n) Glideslope Published Angle

(o) Glideslope OM Dist

(p) Glideslope Localizer Dist

(q) Localizer Cross Runway Dist

(r) Glideslope Width

(s) Localizer Width

(t) Runway End Elevation

(u) Runway Length

(v) Runway True Bearing

(w) Threshold Elevation

(x) Glideslope Threshold Dist

(y) Glideslope Latitude

(z) Glideslope Longitude

(4) Instructions for Completion of ILS Data Base Form:

(a) Enter ILS

(b) Enter Facility ID

(c) Enter 4-Letter Airport Identifier.

(d) Enter RWY Number.

(e) Must be "NNN" for Correct FIS Analyzation.

(f) Enter Localizer Frequency.

(g) Enter Localizer Back-Course Bearing.

(h) Enter Localizer Front Course Bearing.

(i) Enter Glideslope Site Elevation (BFSL Aiming Point Elevation for Order 8240.47). Enter threshold elevation for a Localizer – Only facility.

(j) Enter Localizer Site Elevation.

(k) Enter Facility Category (1,2,3).

(l) Enter Magnetic Variation as + for East; - for West.

(m) Enter Distance from Start of Restriction to RWY Threshold. If No Restriction, Leave Blank. Asterisks (***) are an acceptable value if there is no restriction.

(n) Enter Distance from Glideslope to Center Line of RWY (+ For Right; - For Left). Enter "0" for Localizer-Only or “L0001” if BFSL is Being Applied.

(o) Enter Glideslope Published Angle. Enter a “0” for a Localizer – Only facility.

(p) Enter Distance from Glideslope to Outer Marker in feet. Enter “0.0” if Outer Marker is not present.

(q) Enter Distance From Glideslope to Localizer in Feet. Enter the distance from the localizer/ LDA to threshold for a Localizer-Only.

(r) Enter Localizer Offset Distance From RWY Centerline as + for Right and - for Left. If no offset, enter “0.0”.

(s) Enter Glideslope Width.

(t) Enter Localizer Width.

(u) Enter Elevation at Stop End of RWY.

(v) Enter RWY Length.

(w) Enter True Heading.

(x) Enter Threshold Elevation.

(y) Enter Glideslope to Threshold Distance; "0" if Localizer Only.

(z) Enter Glideslope Latitude; Use TH Latitude if Localizer Only. Use Aiming Point Coordinates for BFSL.

(aa) Enter Glideslope Longitude (See Z).

(5) PAR/ VASI Database:

(a) Facility Type

(b) Facility ID

(c) Airport ID

(d) Restriction Flag

(e) GP Intercept Elevation

(f) Magnetic Variation

(g) GS PUB Angle

(h) RWY End Elevation

(i) RWY Length

(j) RWY True HDG

(k) Threshold Elevation

(l) GP INT to TH Offset

(m) GP INT LAT

(n) GP INT LONG

(6) Instructions for Completion of PAR / VASI Data Base Forms:

(a) Enter Type of Facility.

(b) Enter Facility ID.

(c) Enter 4-Letter Airport Identifier.

(d) Enter “N” for Unrestricted, or “Y” for Restricted.

(e) Enter RWY: GPI (PAR) or RRP (VASI) Elevation.

(f) Enter Magnetic Variation as + for East or - for West.

(g) Enter Published Angle.

(h) Enter RWY Stop End Elevation.

(i) Enter RWY Length.

(j) Enter RWY True Heading.

(k) Enter Threshold Elevation.

(l) Enter GPI to Threshold (PAR) or RRP to Threshold (VASI) Distance.

(m) Enter RWY: GPI (PAR) or RRP (VASI) Latitude.

(n) Enter RWY: GPI (PAR) or RRP (VASI) Longitude.

B. FIS PREFLIGHT CHECKS. The **AET** should accomplish the following checks prior to take-off:

(1) Apply 115VAC, 28VDC, and 26VAC to the FIS.

(2) While waiting for the FIS to come on line, momentarily pull the #1 and #2 TACAN 115VAC circuit breakers. On both TACAN Display Units, ensure the range and bearing failure lights are ON.

(3) Reset the circuit breakers.

(4) On both TACAN Display Units:

(a) Set the OPERATE/ CAL switch to **CAL.**

(b) Set OBS CONTROL switch to **MANUAL.**

(c) BEARING DEGREES should indicate 000.0, ± 0.2.

(d) The **FROM** light should be ON.

(e) Select **15 HZ ONLY** on the BEARING select switch.

(f) BEARING DEGREES should indicate 9.0 - 11.0.

(g) Set OBS thumbwheel to **180.**

(h) The **"TO"** indicator light should be ON.

(i) Return all switches to their normal settings.

(5) With the FIS "on-line", proceed to the Operational Verification screen.

(6) Select Hard Disk Drive, then ENTER.

(7) Select the "Perform Hard Disk Drive Verification" prompt, then ENTER.

(8) Ensure the test passes.

(9) Select the Printer Plotter from the Operational Verification menu.

(10) Select the "Perform Printer Plotter Verification" prompt, then ENTER.

(11) Ensure the test passes.

(12) Select NAV RECEIVERS (ILS) from the Operational Verification screen.

(13) Type in **any** ILS frequency for both receivers, then ENTER.

(14) On the top of the Operator's Console, select and hold the #1 and #2 L/U toggle switch in the "UP" position.

(a) Primary and Secondary LOC Deviation should indicate approximately 90 µA **negative.**

(b) Primary and Secondary GS Deviation should indicate approximately 78 µA **negative**.

(15) Select and hold #1 and #2 R/D toggle switch in the "down" position.

(a) Primary and Secondary LOC Deviation should indicate approximately 90 µA **positive.**

(b) Primary and Secondary GS Deviation should indicate approximately 78 µA **positive**.

(16) If possible, select a local ILS frequency in the ILS Operational Verification screen.

Compare LOC and GS deviation, modulation, and signal strength of both receivers

(17) Select NAV RECEIVERS (VOR) from the Operational Verification screen.

(18) Type in any VOR frequency, then ENTER.

(19) Select VOR-1 and 2 on the RMI selector switch.

(20) Activate and hold the #1 and #2 VOR Self Test switch.

(a) The VDU VOR Bearing should indicate $0.0 \pm 0.4°$.

(b) The RMI needles should swing to 358 - 002°.

(21) Release the VOR Self-Test switches.

(22) If possible, select a local VOR frequency in the VOR Operational Verification screen.

Compare VOR bearing, modulations, and signal strength of both receivers.

(23) Select the Marker Beacon Receiver from the Operational Verification menu.

(24) Press the Marker Beacon Test switch down (located on the top of the Operator's Console.

The OM, MM, and IM lights should light sequentially, and the Marker Beacon AGC VDU display should indicate approximately -30 when each beacon lights.

(25) While the aircraft is taxiing, select “Altimeters and ADC” from the Operational Verification screen.

(26) With the Laser Conditioning Switch and the Laser Key on, monitor the VDU laser altitude on takeoff.

(27) The VDU should display the aircraft's AGL altitude from 30 - 600 ft.

(28) If the display remains at zero, the laser is inoperative, disabling ILS-3, PAR, and airfield lighting approach modes.

NOTE

The laser will not fire at altitudes less than 30 ft; therefore, it is normally indicating "0" on the ground..

(29) From the FIS Main Menu, select "Facility Inspection".

(30) Select "FIS AUTO" from the cockpit.

(31) From the Facility Inspection menu, select a facility type within 300 nm of the aircraft.

(32) Follow the on-screen prompts until reaching the "En-Route Navigation Screen."

(33) Monitor the "POS" number on the lower right of the VDU.

(34) Within 5-10 seconds the POS should change to a number less than 1° and 1,000 feet.

(35) On the keyboard press "CURR DME".

(36) Ensure several facilities on the DME page have asterisks, indicating the FIS is multilaterating.

(37) On the keyboard press "Enter". A list of available satellites is shown.

C. SIERRA AFIS GPS OPERATION

Prior to Flight:

(1) ADADS powered - up.

(2) FMS Initialized.

(3) From the Operational Verification screen, select “GPS SENSOR UNIT”.

(4) Ensure the correct Sensor Operational Mode is displayed, as follows:

(a) 0 = Self – Test (Only stays in this mode for 5 seconds after “Power - On” condition.).

(b) 1 = Initialization (Hardware set-up for next mode).

(c) *2 = Acquisition (Sensor searching for satellites, collecting almanac if required, and fixing a position).

(d) 3 = Navigation (Normal operation; indicates a minimum of 4 satellites tracked, as in 3D).

(e) 4 = Altitude assisted navigation (3 satellites tracked; FMS providing altitude information to the sensor. Must reacquire a 4th satellite within 5 minutes, or a fault condition will occur).

(f) 7 = Fault (GPS is inoperative)

* Maximum Sensor acquisition time:
75 seconds with initialization data provided from the FMS.
10 minutes as a “stand - alone” unit.
90 seconds to reacquire satellites once interrupted.

(5) Monitor the Dilution of Precision in both the vertical (VDOP) and horizontal (HDOP) plane:

Good “DOP’s” are 1.0 - 2.0 (1.0 most accurate).
A good HDOP for flight inspection is < 2.8.

(6) Monitor the Figures of Merit (VFOM and HFOM); this is the maximum (95% accurate) GPS accuracy, in meters. **A good HFOM for flight inspection is < 183 meters.**

NOTE

The DOP and FOM data is dependent on line-of-sight with the satellites. If poor DOP or FOM, ensure the Sensor is operational (an operational mode of 7 is <u>not displayed),</u> and recheck airborne.

(7) From the Main Menu page, select "Database Management".

(a) Select "Set Molodensky Constants".

(b) Per the Airport/ NAVAID database product, select the applicable GPS Datum, only if directed by AVN-210. NAD83/ WGS84 coordinates are to be used for all commissioning flight inspections.

NOTE 1

NAD 83 is the default DATUM, and is used throughout the CONUS.

NOTE 2

If the datum is unknown, verify the correct datum with the host country, or other sources.

D. AIRBORNE OPERATIONS

(1) Select FIS AUTO mode (GPS data is available to ADADS in this mode **<u>only.</u>)**.

(2) Enter the Flight Inspection En route screen of the first NAVAID scheduled for flight check (GPS will update ADADS positioning immediately; not limited to the 300 nm window as DME(s) are).

(3) Press the “CURR DME/GPS” key.

(a) The screen is DME only data, unchanged from prior ops.

(b) Data will be available only if the aircraft is within the 300 nm window.

(4) Press the “ENTER” key,

(a) Satellite data is now available.

(b) Determine sufficient satellites are available to do the mission (**minimum of 5 recommended for GPS-Only positioning).**

(c) Monitor the FOM and DOP data. Remember a **HDOP of < 2.8 and a HFOM of < 183 meters are recommended for flight inspection.**

(5) Remain on the En route Screen until necessary to start a flight profile (allows maximum satellite and DME positioning inputs).

(6) Periodically recheck DME and satellite accuracy via the “CURR DME/ GPS” key.

(7) The “POS” value on the Real-Time screen reflects both DME <u>and</u> satellite combined position.

(8) If satellite data disappears from the “CURR DME/GPS” screen, recheck the GPS Sensor Operational Verification page.

(a) A 7 Operational Mode number could indicate an inoperative Sensor.

(b) Less than 3 satellites tracked would also disable input to the ADADS.

(c) Flight Inspection will now have to be done via DME-Only or FIS Manual means.

(d) The only way to manually disable the GPS Sensor is to pull the CB, located in the cockpit (labeled GNSSU).

NOTE

The following GPS error codes will be displayed on the VDU for GPS abnormalities:

GPS: Maintenance Word 1 Critical Error.
GPS: Maintenance Word 2 Critical Error.
GPS: IRS/FMS is not present.
GPS: Operational Mode Fault.
GPS: Sensor is in Self-test mode.
GPS: Sensor is in Initialization mode.
GPS: Sensor is in Acquisition mode.
GPS: Sensor is not receiving data.
GPS: Fault, GNSSU unit is not operational.

E. “BOOT FROM DISK” FLIGHT INSPECTION PROGRAM CHANGE

(1) This modification relocates the program from EPROM chips to permanent hard disk. Initially, a tape is used to load the program; thereafter, it is automatically loaded to ADADS each time power is applied.

(2) The operation of ADADS for any flight inspection profile is unchanged, except, if ADADS “lock-ups” are encountered or if hard drive errors occur:

(a) Place the flight inspection program tape in the tape drive.

(b) Remove, then reapply AFIS power.

(c) Once AFIS comes on-line (3-3.5 minutes) and the tape drive spools up, the F.I. program will automatically reload to the hard drive.

(3) If hard drive and/or ADADS errors continue:

(a) Select “Database Management” from the Main Menu.

(b) Remove any tapes from the tape drive.

(c) Select “Format Disk” from the DB menu.

(d) Follow screen prompts until the hard drive is reformatted.

(e) Place the flight inspection program tape in the drive.

(f) Remove, then reapply AFIS power.

(g) Follow prompts to the F.I. screen.

(h) Select Database Management again.

(i) Place the FAA Facility Database tape in the drive, and wait for the drive to set-up the tape (about 1 minute).

(j) Select "Load/ Save Database from the screen option.

(k) When prompted, load both the FAA and Supplemental Databases from the tape.

(l) Once the screen indicates a satisfactory tape load, remove the tape from the drive.

F. EMBEDDED TRAINING SYSTEM

(1) The Embedded Training System (ETS), resident within the ADADS software, provides the operator the opportunity to simulate real-time operation of the AFIS. ETS allows the operator to perform <u>simulated</u> inspections for all facilities and profiles. During the simulated inspection, aircraft position and NAVAID signals are generated by the ADADS computer. This is based on information contained in the facility database and embedded training setup data entered by the operator (or default setup if the operator elects).

(2) The ETS enables the Hawker to be utilized as a flight inspection simulator, complete with realistic VDU and plotter actions, without ever leaving the ground. With nothing more than a power cart, the Hawker becomes the perfect classroom. An instructor can set up an entire series of flight inspection profiles, complete with preplanned facility NAVAID irregularities. Once the trainee sits at the panel, he sees and analyzes all data real-time. In this manner, specific problem areas can be addressed and tailored to the needs of the student.

(3) ETS is selected from the AFIS main menu. Selecting "Startup Profiles" allows the instructor to manipulate a profile. Selecting "Restore Default Parameters" will result in perfect alignment, angles, widths, etc., per entries in the FDB. A "0" will then appear in the data field.

(4) Aircraft position, altitude, and direction of flight are also selectable from the same menu.

(5) Each measurable facility parameter can be altered if desired. Some examples of this are as follows:

(a) ILS- - Low clearances can be induced by selecting a positive 100 - 110 µA bend at a negative azimuth/ 150 Hz side (example - 20°). The duration of the bend should be at least 10° to look like an actual low clearance. The opposite indications would be true for low clearances in positive azimuth areas.

(b) ILS-3 - A 30 µA localizer bend located 0.5 nm from threshold, with a duration of 3,000 ft will result in 16 - 17 µA of structure. Negative localizer alignment results in reported right alignment.

A 30 µA glide slope bend located at 2 nm from threshold, with a duration of 3,000 ft will indicate 26µA of zone 2 structure.

(c) RHO-THETA Radials - A -4.0° bend over 6,000 ft shows as a positive bend in the course.

(6) TI 4040.25 details the operation of the ETS. The following are some unique features not covered elsewhere:

(a) There is no En route Screen. Once the profile is selected, the simulator starts. The operator must quickly press the Start/ Stop key to catch the entire run. When setting up the simulator, allow some additional aircraft track to compensate.

(b) The VDU and plots look exactly the same as during a facility inspection, except the word "Training" appears on the screen and the start of all plots.

(c) Pilot runway marks and laser inputs are automatic on an ILS-3. No action, other than AET inputs, is required.

(7) Although mentioned at various locations in TI 4040.25, the following is a complete listing of unique keyboard entries for the ETS:

(a) CTL/ P - Simulates a pilot mark on the VDU and plotter (VP marks, etc.).

(b) CTL/ F or CTL-T - Simulates a FI mark.

(c) CTL/ R - Simulates a RWY Threshold event.

(d) CTL/ D - Stops/ Restarts the simulator, VDU, and the plotter. Allows the instructor or student to take the time to study a particular event as it occurs.

(e) CTL/ X - Simulates an aircraft right turn.

(f) CTL/ Z - Simulates an aircraft left turn.

(g) CTL/ A - Simulates an aircraft climb.

(h) CTL/ S - Simulates aircraft descent.

CHAPTER II. AIRCRAFT OPERATIONS

9. POST MAINTENANCE AIRCRAFT CHECKOUT

The success of most avionics repairs and calibration can adequately be determined by maintenance procedures. Such things as antenna replacements and repairs affecting post-run results, e.g., ILS error traces, require airborne evaluation. TIEO 92-E-06 provides tolerances to be applied unless indicated below. The following maintenance actions may require the associated check prior to dispatch from home station for flight inspection work:

A. VOR/ ILS ANTENNA REPLACEMENT

Fly an ILS-1, CW and CCW, at a distance to have less than 50 μV of signal strength on centerline and an altitude for LOS to facility. Compare the difference in course width, signal strength, and interference between crossings. Apply tolerance of $\pm$ 0.1° between runs and < 5μV signal strength overall. Ensure adequate DME or Hybrid positioning.

B. MARKER BEACON RECEIVER/ ANTENNA REPAIR

Fly an ILS-3; compare Marker Beacon Minor Axis announced width manually calculated results. There is no tolerance between the calculations, but the two should be reasonably close. Marker Beacons will normally be evaluated by Engineering.

C. NCU/ ISS REPAIR/ REPLACEMENT TO CORRECT DATA COLLECTION OR ANALYSIS PROBLEM

The aircraft should be flown a similar profile as that flown when the discrepancy was first noted. The aircraft logbook may be referenced to determine the original discrepancy. Tolerance: Correct operation.

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FEDERAL AVIATION ADMINISTRATION
FLIGHT INSPECTION STANDARD
OPERATING PROCEDURES MANUAL

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CHAPTER III. SCHEDULING PROCEDURES

1. SCHEDULING

A. GENERAL

Effective scheduling of resources and task accomplishments is one of the most critical and complex aspects of the flight inspection mission. Aircraft availability and time must be carefully balanced with flight inspection and procedures requirements, aircrew qualifications, training/evaluation, and aircraft maintenance.

B. BASIC FLIGHT SCHEDULE

(1) The long-range flight schedule is a plan covering a one-year period, which identifies proposed crewmember assignments by weeks, as applicable.

(2) Specific crewmember assignments to the flight schedule shall be posted at least 14 days prior to the flight date.

(3) The Flight Inspection Field Office (FIFO) Manager shall ensure all crewmembers are qualified to act on the assigned mission.

(4) Any change to the flight schedule shall be made in a readily identifiable manner and promptly posted. Any changes must be coordinated with the affected crewmember(s).

(5) Exchange of schedule assignments by personnel, of equal qualifications and/or certification, requires approval by the FIFO Manager or designated representative. Exchange of schedule assignments shall:

- (a) Be consistent with operational requirements.
- (b) Not conflict with scheduled training.
- (c) Be coordinated with the immediate supervisor.
- (d) Not result in overtime or an increase in premium pay cost.

(6) Flight inspection long-range schedules shall be retained on file for two (2) years and be available for review. Any changes to a schedule will be clearly identified, attached to the affected schedule, and retained with the original.

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2. AIRCREW SCHEDULING

A. THE FLIGHT INSPECTION FIELD OFFICE (FIFO): OFFICE MANAGER AND LEAD AET

(1) Publish the annual forecast flying schedule, as applicable. Specify duty, i.e., travel, training, evaluation, school, leave, etc. The schedule shall be updated at the beginning of each month as changes occur.

(2) Coordinate changes affecting the forthcoming 30-day period, with the crewmember(s) involved.

(3) Post permanent assignments to the flight schedule no less than 14 days prior to the flight date. Supervisory personnel should make every effort to maintain the posted schedule.

(4) Review monthly the flying hour summary of all assigned crewmembers, to ensure that the flight time meets the recent flight experience and rest requirements of the Aviation System Standards Operations Manual (FOM).

(5) Ensure all crewmembers assigned to the flying schedule meet all requirements as outlined and directed in Chapter III of the FOM.

B. CREWMEMBER ACTIONS

(1) Whenever possible, the crewmember should provide their supervisors with anticipated absences due to leave, and/or other reasons for non-availability to meet the flying schedule. Notification should be submitted at least 30 days prior to the date of a scheduled flight.

NOTE

Non-emergency changes will be kept to a minimum in the four weeks prior to the occurrence. Non-emergency removal from the flying schedule should not be approved in the two weeks prior to scheduled TDY or local flying. <u>This will not preclude a coordinated exchange of scheduled flying duties.</u>

(2) Notify supervisors as soon as possible of any unforecast or emergency-type changes that affect availability for the flying schedule.

(3) Notify their supervisors if the forecast flying or training schedule will cause conflict with applicable parts of the FOM.

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3. FLIGHT INSPECTION MISSION SCHEDULING

A. GENERAL

(1) All flight inspection mission scheduling will be consistent with the policy and procedural guidance contained in the United States Standard Flight Inspection Manual (USSFIM), Order 8200.1, Section 104, Types and Priorities of Flight Inspections. The FICO or Flight Inspection Operations Division/ Branch Managers shall approve all flight inspection missions.

(2) The Centralized Flight Monitoring Scheduling System (CFMSS) is the basis for effective scheduling of assigned aircraft, mission/ flightcrew documentation, and maintenance of facility data.

(3) The scheduling of fleet aircraft, and the responsibilities of individuals and functions to support the flight inspection mission, are listed in “B” and “C” below.

B. FLIGHT INSPECTION CENTRAL OPERATIONS BRANCH

(1) Performs all pre-coordination and re-coordination with Airway Facilities and Air Traffic Control for each flight inspection. Final coordination remains a crew responsibility.

(2) Coordinate, prepare, amend, and complete all required documentation to support the schedule.

(3) Be knowledgeable of CFMSS as a flight and mission management tool. This shall include extracting and entering the necessary data for daily flight operations for aircraft and flightcrews.

(4) Extract from CFMSS the 30-day workload projection schedule of periodic work and the facility flight check master report. The facility flight check master report shows the flight inspection due dates of those facilities comprising the workload currently assigned to the Flight Inspection Field Office.

(5) Accept, document, and schedule special- (non-routine) type flight inspection requests, i.e., commissioning, special request, after accident, and Private-Use Approaches.

(6) Publish, distribute, and file weekly workload schedules. The proposed scheduled workload will:

(a) Be predicated on recurring and special flight inspection requests and requirements, and prioritized accordingly with consideration for geographic proximity.

(b) Incorporate the workload to accomplish special (non-routine) flight inspection requests in conjunction with a weekly periodic flight schedule when conditions permit.

(7) Coordinate with aircraft/avionics maintenance to confirm the availability of scheduled aircraft.

(8) Enter DFL flight inspection information into CFMSS no later than three (3) working days after receipt from the aircrew.

C. SCHEDULED FLIGHTCREW RESPONSIBILITIES

The PIC (SIC as directed) shall: Confirm the assigned flight schedule is complete, accurate, and any changes have been fully coordinated.

NOTE

Deviations should be kept to a minimum. The flightcrew will be fully informed of any changes. If the duty time for the next day is to change, the PIC shall notify the crew of the new duty time prior to the end of day before the date of the change.

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CHAPTER IV. FLIGHT INSPECTION MISSION TRAINING

1. GENERAL

Training for the flight inspection mission is accomplished using two methods. The primary method is OJT; both pilot and AET will be in this program until recommended by the trainer for upgrade. Formal classroom training will also be given as the schedule allows. Each crewmember will receive training IAW FAR Part 135.

FAA Order 8200.1, United States Standard Flight Inspection Manual: Section 102 of this order designates the authority and responsibilities of the flight inspection crewmember relating to the training required.

Order VN 8240.3, Certification of Flight Inspection Personnel: Defines the procedure required for certification of Aviation System Standards (AVN) and military personnel involved in certifying navigation services and/or instrument flight procedures.

TI 4040.51, Aviation System Standards Flight Training Manual: Designates specific requirements for pilot and AET training.

The manuals above are not inclusive of manuals needed for certification as a flight inspection pilot or AET. The information required for certification covers several manuals available through your trainer or supervisor.

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CHAPTER V. INTERNATIONAL PROCEDURES

1. INTERNATIONAL OPERATIONS

A. GENERAL

International flight inspection operations are defined as operations outside the 48 contiguous states, District of Columbia, Alaska, and Canadian airspace south of the Northern Control Areas or Area of Magnetic Unreliability.

B. RULES OF THE AIR AND OPERATION OF AIRCRAFT

International Operations shall:

(1) When over the high seas, comply with International Civil Aviation Organization (ICAO) Annex 2, Rules of the Air.

(2) When within a foreign country, flight operations must also comply with the regulations of that country and the rules of Title 14, CFR 61, 91, and 135, whichever is the most restrictive.

NOTE
Aeronautical Information Publication (AIP) information is reproduced in U.S., DOD, and/or Jeppesen publications.

(3) Comply with the requirements and procedures of this manual when not inconsistent with B(1) and (2) above.

C. REFERENCE MATERIALS REQUIRED FOR INTERNATIONAL OPERATIONS

The following materials are used for planning international flight inspection missions. This is not all-inclusive, nor are all of the listed materials necessary for each operation. The particular operation and the diplomatic protocols in effect at the time dictate which materials are applicable.

(1) DOD Flight Information Publication (FLIP), General Planning, Area Planning, and Special Use Airspace booklets.

(2) DOD/USAF Foreign Clearance Guide (FCG). (http://www.fcg.pentagon.mil)

(3) FAA International Flight Information Manual (IFIM).

(4) FAA Advisory Circular AC 91-70, Oceanic Operations.

(5) North Atlantic MNPS Airspace Operations Manual.

(6) DOD and Jeppesen en route and terminal publications.

(7) NOTAM's, domestic and international.

(8) National Aeronautical Information Publications (AIP).

(9) Aircrew Information File (AIF). (http://avnnet.jccbi.gov)

D. DIPLOMATIC CLEARANCES

(1) The FICO is responsible for all aircraft and personnel clearances.

(2) Aircraft clearance requirements and the procedures for obtaining the proper clearances are contained in the FCG and the IFIM. Personnel clearance requirements are contained in FAA Order 1510.2, Air Traffic Services Official Foreign Travel Procedures.

(3) The Manager/Chief Pilot of the organization to which the aircraft is assigned is responsible for ensuring that the proper clearances are obtained and that any special arrangements which may be necessary are made (aircraft/crew security, fund cites for services, visa support, etc.)

(4) The PIC shall ensure that proper clearances have been received and that any special arrangements are made (fund cites, visa support, etc.) prior to conducting operations in country or its airspace where clearances are required.

E. CUSTOMS, IMMIGRATION, AND PUBLIC HEALTH

Customs, immigration, and public health requirements and procedures are contained in the FCG, IFIM, and Jeppesen publications. The PIC shall ensure that all persons aboard the aircraft have the necessary documents for compliance with customs, immigration, and public health requirements for each scheduled destination.

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